

(19)

Europäisches Patentamt

European Patent Office

Office européen des brevets



(11)

EP 0 919 542 A2

(12)

EUROPEAN PATENT APPLICATION

(43) Date of publication:
02.06.1999 Bulletin 1999/22(51) Int. Cl.⁶: C07C 233/64, C07C 235/42,
C07C 317/32, C07C 323/42,
C07D 295/192, A01N 37/18,
A01N 43/00, A01N 43/84,
A01N 57/00

(21) Application number: 98122107.0

(22) Date of filing: 23.11.1998

(84) Designated Contracting States:
 AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU
 MC NL PT SE
 Designated Extension States:
 AL LT LV MK RO SI

(30) Priority: 25.11.1997 JP 339393/97

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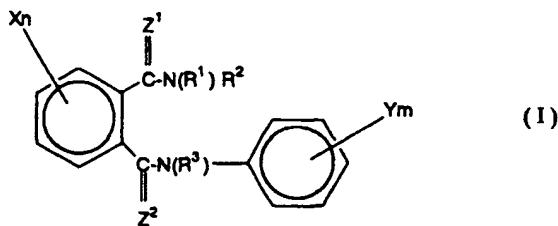
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(54) Phthalic acid diamide derivatives, agricultural and horticultural insecticides, and a method for application of the insecticides

(57) The present invention provides a phthalic acid diamide derivative represented by the general formula (I),



(wherein R¹, R² and R³ may be same or different, and are each a hydrogen atom, a cyano group, a C₃-C₆ cycloalkyl group, a halo-C₃-C₆ cycloalkyl group, a C₃-C₆ cycloalkenyl group, a halo-C₃-C₆ cycloalkenyl group, or a group of the formula -A¹-Q₁; X may be the same or different and are each a hydrogen atom, a halogen atom, a cyano group, a nitro group, a phenyl group, a substituted phenyl group, a naphthyl group, a substituted naphthyl group, a heterocyclic group, a substituted heterocyclic group; or a group of the formula -A²-R⁷; n is an integer of 1 to 4; Y may be same or different and are each a hydrogen atom, a halogen atom, a cyano group, a nitro group, a phenyl group, a substituted phenyl group, a naphthyl group, a substituted naphthyl group, a heterocyclic group, a substituted heterocyclic group or a group of the formula -A²-R⁷; m is an integer of 1 to 5; Z¹ and Z² are each an oxygen atom or a sulfur atom), and an agricultural and horticultural insecticide containing said phthalidamide derivative, as well as to provide a method for use of said insecticide.

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The agricultural and horticultural insecticides of the present invention show excellent activities for controlling injurious insects.

Description**BACKGROUND OF THE INVENTION****5 FIELD OF THE INVENTION**

[0001] The present invention relates to phthalic acid diamide derivatives, agricultural and horticultural insecticides containing said derivative as an active ingredient, and a method for application of the insecticides.

10 RELATED ART

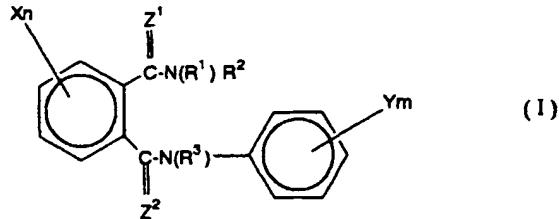
[0002] Japanese Patent Application Nos. 59-163353 and 61-180753 and J.C.S. Perkin I, 1338-1350, (1978), etc. disclose some of the phthalic acid diamide derivatives of the present invention but neither describe nor suggest their usefulness as agricultural and horticultural insecticides.

15 SUMMARY OF THE INVENTION

[0003] The present inventors earnestly studied in order to develop a novel agricultural and horticultural insecticide, and consequently found that the phthalic acid diamide derivatives represented by the general formula (I) of the present 20 invention are novel compounds not known as agricultural and horticultural insecticides in any literature and that said derivatives including the compounds disclosed in the above references can be used for a new purpose as agricultural and horticultural insecticides. Thus, the present invention has been accomplished.

DETAILED DESCRIPTION OF THE INVENTION

25 [0004] The present invention relates to phthalic acid diamide derivatives of the general formula (I).



30 wherein R¹, R² and R³ may be the same or different, and are each a hydrogen atom, a cyano group, a C₃-C₆ cycloalkyl group, a halo-C₃-C₆ cycloalkyl group, a C₃-C₆ cycloalkenyl group, a halo-C₃-C₆ cycloalkenyl group or a group of the formula -A¹-Q₂ (wherein A¹ is -O-, -S-, -SO₂-, -C(=O)-, a group of the formula -N(R⁴) - (wherein R⁴ is a C₁-C₆ alkylcarbonyl group, a halo-C₁-C₆ alkylcarbonyl group, a C₁-C₆ alkoxy carbonyl group, a phenylcarbonyl group, or a substituted phenylcarbonyl group having at least one substituent which may be the same or different, and is selected from the group consisting of a halogen atom, a cyano group, a nitro group, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₂-C₆ alkynyl group, a halo-C₂-C₆ alkenyl group, a C₂-C₆ alkynyl group, a halo-C₂-C₆ alkynyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfanyl group, a halo-C₁-C₆ alkylsulfanyl group, a C₁-C₆ alkylsulfonyl group, a halo-C₁-C₆ alkylsulfonyl group, a mono-C₁-C₆ alkylamino group and a di-C₁-C₆ alkylamino group which may be the same or different), a C₁-C₈ alkylene group, a C₃-C₆ alkenylene group or a C₃-C₆ alkynylene group;

40 (1) when A¹ is -O- or a group of the formula -N(R⁴)-(wherein R⁴ is the same as defined above), then Q is a hydrogen atom, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₃-C₆ alkenyl group, a halo-C₃-C₆ alkenyl group, a C₃-C₆ alkynyl group, a phenyl group, a substituted phenyl group having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a cyano group, a nitro group, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₂-C₆ alkenyl group, a halo-C₂-C₆ alkenyl group, a C₂-C₆ alkynyl group, a halo-C₂-C₆ alkynyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfanyl group, a halo-C₁-C₆ alkylsulfanyl group, a C₁-C₆ alkylsulfonyl group, a halo-C₁-C₆ alkylsulfonyl group, a mono-C₁-C₆ alkylamino group and a di-C₁-C₆ alkylamino group which may be the same or different, a C₁-C₈ alkylene group, a C₃-C₆ alkenylene group or a C₃-C₆ alkynylene group;

45 (2) when A¹ is -S- or -SO₂- or -C(=O)-, then Q is a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₃-C₆ alkenyl group, a halo-C₃-C₆ alkenyl group, a C₃-C₆ alkynyl group, a phenyl group, a substituted phenyl group having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a cyano group, a nitro group, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₂-C₆ alkenyl group, a halo-C₂-C₆ alkenyl group, a C₂-C₆ alkynyl group, a halo-C₂-C₆ alkynyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfanyl group, a halo-C₁-C₆ alkylsulfanyl group, a C₁-C₆ alkylsulfonyl group, a halo-C₁-C₆ alkylsulfonyl group, a mono-C₁-C₆ alkylamino group and a di-C₁-C₆ alkylamino group which may be the same or different, a C₁-C₈ alkylene group, a C₃-C₆ alkenylene group or a C₃-C₆ alkynylene group;

50 (3) when A¹ is -C(=O)-, then Q is a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₃-C₆ alkenyl group, a halo-C₃-C₆ alkenyl group, a C₃-C₆ alkynyl group, a phenyl group, a substituted phenyl group having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a cyano group, a nitro group, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₂-C₆ alkenyl group, a halo-C₂-C₆ alkenyl group, a C₂-C₆ alkynyl group, a halo-C₂-C₆ alkynyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfanyl group, a halo-C₁-C₆ alkylsulfanyl group, a C₁-C₆ alkylsulfonyl group, a halo-C₁-C₆ alkylsulfonyl group, a mono-C₁-C₆ alkylamino group and a di-C₁-C₆ alkylamino group which may be the same or different, a C₁-C₈ alkylene group, a C₃-C₆ alkenylene group or a C₃-C₆ alkynylene group;

55 (4) when A¹ is -SO₂-, then Q is a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₃-C₆ alkenyl group, a halo-C₃-C₆ alkenyl group, a C₃-C₆ alkynyl group, a phenyl group, a substituted phenyl group having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a cyano group, a nitro group, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₂-C₆ alkenyl group, a halo-C₂-C₆ alkenyl group, a C₂-C₆ alkynyl group, a halo-C₂-C₆ alkynyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfanyl group, a halo-C₁-C₆ alkylsulfanyl group, a C₁-C₆ alkylsulfonyl group, a halo-C₁-C₆ alkylsulfonyl group, a mono-C₁-C₆ alkylamino group and a di-C₁-C₆ alkylamino group which may be the same or different, a C₁-C₈ alkylene group, a C₃-C₆ alkenylene group or a C₃-C₆ alkynylene group;

uent, in the phenyl ring, which may be the same or different and is selected from the group consisting of a halogen atom, a cyano group, a nitro group, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₂-C₆ alkenyl group, a halo-C₂-C₆ alkenyl group, a C₂-C₆ alkynyl group, a halo-C₂-C₆ alkynyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group, a halo-C₁-C₆ alkylsulfonyl group, a mono-C₁-C₆ alkylamino group and a di-C₁-C₆ alkylamino group which may be the same or different;

C₆ alkynyl group, a halo-C₂-C₆ alkynyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group, a halo-C₁-C₆ alkylsulfonyl group, a mono-C₁-C₆ alkylamino group and a di-C₁-C₆ alkylamino group which may be the same or different, or a group of the formula -Z³.R⁵ (wherein Z³ is -O-, -S-, -SO-, -SO₂- or a group of the formula -N(R⁶)-(wherein R⁶ is a hydrogen atom, a C₁-C₆ alkylcarbonyl group, a halo-C₁-C₆ alkylcarbonyl group, a C₁-C₆ alkoxy carbonyl group, a phenylcarbonyl group, a substituted phenylcarbonyl group having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a cyano group, a nitro group, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₂-C₆ alkenyl group, a halo-C₂-C₆ alkenyl group, a C₂-C₆ alkynyl group, a halo-C₂-C₆ alkynyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group, a halo-C₁-C₆ alkylsulfonyl group, a mono-C₁-C₆ alkylamino group and a di-C₁-C₆ alkylamino group which may be the same or different, a phenyl C₁-C₄ alkoxy carbonyl group, or a substituted phenyl C₁-C₄ alkoxy carbonyl group having at least one substituent, in the phenyl ring, which may be the same or different and is selected from the group consisting of a halogen atom, a cyano group, a nitro group, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₂-C₆ alkenyl group, a halo-C₂-C₆ alkenyl group, a C₂-C₆ alkynyl group, a halo-C₂-C₆ alkynyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group, a halo-C₁-C₆ alkylsulfonyl group, a mono-C₁-C₆ alkylamino group and a di-C₁-C₆ alkylamino group which may be the same or different); and

R⁵ is a hydrogen atom, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₃-C₆ alkenyl group, a halo-C₃-C₆ alkenyl group, a C₃-C₆ cycloalkyl group, a halo-C₃-C₆ cycloalkyl group, a C₁-C₆ alkylcarbonyl group, a halo-C₁-C₆ alkylcarbonyl group, a C₁-C₆ alkoxy carbonyl group, a phenyl group, a substituted phenyl group having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a cyano group, a nitro group, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₂-C₆ alkenyl group, a halo-C₂-C₆ alkenyl group, a C₂-C₆ alkynyl group, a halo-C₂-C₆ alkynyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group, a halo-C₁-C₆ alkylsulfonyl group, a mono-C₁-C₆ alkylamino group and a di-C₁-C₆ alkylamino group which may be the same or different, a phenyl C₁-C₄ alkyl group, a substituted phenyl C₁-C₄ alkyl group having at least one substituent, in the phenyl ring, which may be the same or different and is selected from the group consisting of a halogen atom, a cyano group, a nitro group, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₂-C₆ alkenyl group, a halo-C₂-C₆ alkenyl group, a C₂-C₆ alkynyl group, a halo-C₂-C₆ alkynyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group, a halo-C₁-C₆ alkylsulfonyl group, a mono-C₁-C₆ alkylamino group and a di-C₁-C₆ alkylamino group which may be the same or different, a naphthyl group, a substituted naphthyl group having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a cyano group, a nitro group, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₂-C₆ alkenyl group, a halo-C₂-C₆ alkenyl group, a C₂-C₆ alkynyl group, a halo-C₂-C₆ alkynyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group, a halo-C₁-C₆ alkylsulfonyl group, a mono-C₁-C₆ alkylamino group and a di-C₁-C₆ alkylamino group which may be the same or different, a heterocyclic group (which is the same as defined above), or a substituted heterocyclic group (wherein the heterocyclic group is the same as defined above) having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a cyano group, a nitro group, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₂-C₆ alkenyl group, a halo-C₂-C₆ alkenyl group, a C₂-C₆ alkynyl group, a halo-C₂-C₆ alkynyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group, a halo-C₁-C₆ alkylsulfonyl group, a mono-C₁-C₆ alkylamino group and a di-C₁-C₆ alkylamino group which may be the same or different);

ℓ is an integer of 1 to 4); further,
R¹ and R² may form a 4 to 7 membered ring by combining to each other, in which the ring may contain the same or different 1 to 3 hetero atoms selected from the group consisting of oxygen atom, sulfur atom and nitrogen atom;
X may be the same or different, and is a hydrogen atom, a halogen atom, a cyano group, a nitro group, a C₃-C₆ cycloalkyl group, a halo-C₃-C₆ cycloalkyl group, a phenyl group, a substituted phenyl group having at least one substituents which may be the same or different and is selected from the group consisting of a halogen atom, a cyano group, a nitro group, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₂-C₆ alkenyl group, a halo-C₂-C₆ alkenyl group, a C₂-C₆ alkynyl group, a halo-C₂-C₆ alkynyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group, a halo-C₁-C₆ alkylsulfonyl group, a mono-C₁-C₆ alkylamino group and a di-C₁-C₆ alkylamino group which may be the same or different);

5 C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group, a halo-C₁-C₆ alkylsulfonyl group, a mono-C₁-C₆ alkylamino group and a di-C₁-C₆ alkylamino group which may be the same or different, a naphthyl group, a substituted naphthyl group having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a cyano group, a nitro group, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₂-C₆ alkenyl group, a halo-C₂-C₆ alkenyl group, a C₂-C₆ alkynyl group, a halo-C₂-C₆ alkynyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group, a halo-C₁-C₆ alkylsulfonyl group, a mono-C₁-C₆ alkylamino group and a di-C₁-C₆ alkylamino group which may be the same or different, a heterocyclic group (which is the same as defined above), a substituted heterocyclic group (wherein the heterocyclic group is the same as defined above) having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a cyano group, a nitro group, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₂-C₆ alkenyl group, a halo-C₂-C₆ alkenyl group, a C₂-C₆ alkynyl group, a halo-C₂-C₆ alkynyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group, a halo-C₁-C₆ alkylsulfonyl group, a mono-C₁-C₆ alkylamino group and a di-C₁-C₆ alkylamino group which may be the same or different, or a group of the formula -A²-R⁷ (wherein A² is -O-, -S-, -SO₂-, -C(=O)-, -C(=NOR⁸)- (wherein R⁸ is a hydrogen atom, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₃-C₆ alkenyl group, a halo-C₃-C₆ alkenyl group, a C₃-C₆ alkynyl group, a C₃-C₆ cycloalkyl group, a phenyl-C₁-C₄ alkyl group, or a substituted phenyl-C₁-C₄ alkyl group having at least one substituent, in the phenyl ring, which may be the same or different and is selected from the group consisting of a halogen atom, a cyano group, a nitro group, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₂-C₆ alkenyl group, a halo-C₂-C₆ alkenyl group, a C₂-C₆ alkynyl group, a halo-C₂-C₆ alkynyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a mono-C₁-C₆ alkylamino group and a di-C₁-C₆ alkylamino group which may be the same or different), a C₁-C₆ alkylene group, a halo-C₁-C₆ alkylene group, a C₂-C₆ alkenylene group, a halo-C₂-C₆ alkenylene group, a C₂-C₆ alkynylene group or a halo-C₃-C₆ alkynylene group;

30 (1) when A² is -O-, -S-, -SO₂- or -SO₂⁻, then R⁷ is a hydrogen atom, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₃-C₆ alkenyl group, a halo-C₃-C₆ alkenyl group, a C₃-C₆ alkynyl group, a halo-C₃-C₆ alkynyl group, a C₃-C₆ cycloalkyl group, a halo-C₃-C₆ cycloalkyl group, a C₃-C₆ cycloalkenyl group, a halo-C₃-C₆ cycloalkenyl group, a di-C₁-C₆ alkoxyphosphoryl group which may be the same or different, a di-C₁-C₆ alkoxythiophosphoryl group which may be the same or different, a phenyl group, a substituted phenyl group having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a cyano group, a nitro group, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₂-C₆ alkenyl group, a halo-C₂-C₆ alkenyl group, a C₂-C₆ alkynyl group, a halo-C₂-C₆ alkynyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group, a halo-C₁-C₆ alkylsulfonyl group, a mono-C₁-C₆ alkylamino group and a di-C₁-C₆ alkylamino group which may be the same or different, a naphthyl group, a substituted naphthyl group having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a cyano group, a nitro group, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₂-C₆ alkenyl group, a halo-C₂-C₆ alkenyl group, a C₂-C₆ alkynyl group, a halo-C₂-C₆ alkynyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group, a halo-C₁-C₆ alkylsulfonyl group, a mono-C₁-C₆ alkylamino group and a di-C₁-C₆ alkylamino group which may be the same or different, a heterocyclic group (which is the same as defined above), a substituted heterocyclic group (wherein the heterocyclic group is the same as defined above) having at least one substituents which may be the same or different and are selected from the group consisting of a halogen atom, a cyano group, a nitro group, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₂-C₆ alkenyl group, a halo-C₂-C₆ alkenyl group, a C₂-C₆ alkynyl group, a halo-C₂-C₆ alkynyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group, a halo-C₁-C₆ alkylsulfonyl group, a mono-C₁-C₆ alkylamino group and a di-C₁-C₆ alkylamino group which may be the same or different, or a group of the formula -A³-R⁹ (wherein A³ is -C(=O)-, -SO₂-, a C₁-C₆ alkylene group, a halo-C₁-C₆ alkylene group, a C₂-C₆ alkenylene group, a halo-C₂-C₆ alkenylene group, a C₂-C₆ alkynylene group or a halo-C₃-C₆ alkynylene group,

same or different); and

R^{10} is a hydrogen atom, a C_1 - C_6 alkyl group, a halo- C_1 - C_6 alkyl group, a C_3 - C_6 alkenyl group, a halo- C_3 - C_6 alkenyl group, a C_3 - C_6 alkynyl group, a halo- C_3 - C_6 alkynyl group, a C_3 - C_6 cycloalkyl group, a halo- C_3 - C_6 cycloalkyl group, a C_3 - C_6 cycloalkenyl group, a halo- C_3 - C_6 cycloalkenyl group, a phenyl group, a substituted phenyl group having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a cyano group, a nitro group, a C_1 - C_6 alkyl group, a halo- C_1 - C_6 alkyl group, a C_2 - C_6 alkenyl group, a halo- C_2 - C_6 alkenyl group, a C_2 - C_6 alkynyl group, a halo- C_2 - C_6 alkynyl group, a C_1 - C_6 alkoxy group, a halo- C_1 - C_6 alkoxy group, a C_1 - C_6 alkylthio group, a halo- C_1 - C_6 alkylthio group, a C_1 - C_6 alkylsulfinyl group, a halo- C_1 - C_6 alkylsulfinyl group, a C_1 - C_6 alkylsulfonyl group, a halo- C_1 - C_6 alkylsulfonyl group, a mono- C_1 - C_6 alkylamino group and a di- C_1 - C_6 alkylamino group which may be the same or different, a naphthyl group, a substituted naphthyl group having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a cyano group, a nitro group, a C_1 - C_6 alkyl group, a halo- C_1 - C_6 alkyl group, a C_2 - C_6 alkenyl group, a halo- C_2 - C_6 alkenyl group, a C_2 - C_6 alkynyl group, a C_1 - C_6 alkoxy group, a halo- C_1 - C_6 alkoxy group, a C_1 - C_6 alkylthio group, a halo- C_1 - C_6 alkylthio group, a C_1 - C_6 alkylsulfinyl group, a halo- C_1 - C_6 alkylsulfinyl group, a C_1 - C_6 alkylsulfonyl group, a halo- C_1 - C_6 alkylsulfonyl group, a mono- C_1 - C_6 alkylamino group and a di- C_1 - C_6 alkylamino group which may be the same or different, a heterocyclic group (which is the same as defined the above), or a substituted heterocyclic group (wherein the heterocyclic group is the same as defined the above) having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a cyano group, a nitro group, a C_1 - C_6 alkyl group, a halo- C_1 - C_6 alkyl group, a C_2 - C_6 alkenyl group, a halo- C_2 - C_6 alkenyl group, a C_2 - C_6 alkynyl group, a C_1 - C_6 alkoxy group, a halo- C_1 - C_6 alkoxy group, a C_1 - C_6 alkylthio group, a halo- C_1 - C_6 alkylthio group, a C_1 - C_6 alkylsulfinyl group, a halo- C_1 - C_6 alkylsulfinyl group, a C_1 - C_6 alkylsulfonyl group, a halo- C_1 - C_6 alkylsulfonyl group, a mono- C_1 - C_6 alkylamino group and a di- C_1 - C_6 alkylamino group which may be the same or different));

(2) when A^2 is $-C(=O)-$ or a group of the formula $-C(=NOR^8)$ -(wherein R^8 is the same as defined above), then R^7 is a C_1-C_6 alkyl group, a halo C_1-C_6 alkyl group, a C_2-C_6 alkenyl group, a halo- C_2-C_6 alkenyl group, a C_3-C_6 cycloalkyl group, a halo- C_3-C_6 cycloalkyl group, a C_1-C_6 alkoxy group, a C_1-C_6 alkylthio group, a mono- C_1-C_6 alkylamino group, a di- C_1-C_6 alkylamino group which may be the same or different, a phenyl group, a substituted phenyl group having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a cyano group, a nitro group, a C_1-C_6 alkyl group, a halo- C_1-C_6 alkyl group, a C_2-C_6 alkenyl group, a halo- C_2-C_6 alkenyl group, a C_2-C_6 alkynyl group, a halo- C_2-C_6 alkynyl group, a C_1-C_6 alkoxy group, a halo- C_1-C_6 alkoxy group, a C_1-C_6 alkylthio group, a halo- C_1-C_6 alkylthio group, a C_1-C_6 alkylsulfinyl group, a halo- C_1-C_6 alkylsulfinyl group, a C_1-C_6 alkylsulfonyl group, a halo- C_1-C_6 alkylsulfonyl group, a mono- C_1-C_6 alkylamino group and a di- C_1-C_6 alkylamino group which may be the same or different, a phenylamino group, a substituted phenylamino group having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a cyano group, a nitro group, a C_1-C_6 alkyl group, a halo- C_1-C_6 alkyl group, a C_2-C_6 alkenyl group, a halo- C_2-C_6 alkenyl group, a C_2-C_6 alkynyl group, a C_1-C_6 alkoxy group, a halo- C_1-C_6 alkoxy group, a C_1-C_6 alkylthio group, a halo- C_1-C_6 alkylthio group, a C_1-C_6 alkylsulfinyl group, a halo- C_1-C_6 alkylsulfinyl group, a C_1-C_6 alkylsulfonyl group, a halo- C_1-C_6 alkylsulfonyl group, a mono- C_1-C_6 alkylamino group and a di- C_1-C_6 alkylamino group which may be the same or different, a naphthyl group, a substituted naphthyl group having one or more substituents which may be the same or different and are selected from the group consisting of a halogen atom, a cyano group, a nitro group, a C_1-C_6 alkyl group, a halo- C_1-C_6 alkyl group, a C_2-C_6 alkenyl group, a halo- C_2-C_6 alkenyl group, a C_2-C_6 alkynyl group, a halo- C_2-C_6 alkynyl group, a C_1-C_6 alkoxy group, a halo- C_1-C_6 alkoxy group, a C_1-C_6 alkylthio group, a halo- C_1-C_6 alkylthio group, a C_1-C_6 alkylsulfinyl group, a halo- C_1-C_6 alkylsulfinyl group, a C_1-C_6 alkylsulfonyl group, a halo- C_1-C_6 alkylsulfonyl group, a mono- C_1-C_6 alkylamino group and a di- C_1-C_6 alkylamino group which may be the same or different, a heterocyclic group (which is the same as defined above), or a substituted heterocyclic group (wherein the heterocyclic group is the same as defined above) having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a cyano group, a nitro group, a C_1-C_6 alkyl group, a halo- C_1-C_6 alkyl group, a C_2-C_6 alkenyl group, a halo- C_2-C_6 alkenyl group, a C_2-C_6 alkynyl group, a C_1-C_6 alkoxy group, a halo- C_1-C_6 alkoxy group, a C_1-C_6 alkylthio group, a halo- C_1-C_6 alkylthio group, a C_1-C_6 alkylsulfinyl group, a halo- C_1-C_6 alkylsulfinyl group, a C_1-C_6 alkylsulfonyl group, a halo- C_1-C_6 alkylsulfonyl group, a mono- C_1-C_6 alkylamino group and a di- C_1-C_6 alkylamino group which may be the same or different.

same or different.

group, a halo-C₂-C₆ alkynyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfanyl group, a halo-C₁-C₆ alkylsulfanyl group, a C₁-C₆ alkylsulfonyl group, a halo-C₁-C₆ alkylsulfonyl group, a mono-C₁-C₆ alkylamino group and a di-C₁-C₆ alkylamino group which may be the same or different, a heterocyclic group (which is the same as defined above), a substituted heterocyclic group (wherein the heterocyclic group is the same as defined above) having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a cyano group, a nitro group, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₂-C₆ alkenyl group, a halo-C₂-C₆ alkenyl group, a C₂-C₆ alkynyl group, a halo-C₂-C₆ alkynyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfanyl group, a halo-C₁-C₆ alkylsulfanyl group, a C₁-C₆ alkylsulfonyl group, a halo-C₁-C₆ alkylsulfonyl group, a mono-C₁-C₆ alkylamino group and a di-C₁-C₆ alkylamino group which may be the same or different, or a group of the formula -A⁶-R¹⁴ (wherein A⁶ is -C(=O)-, -SO₂-, a C₁-C₆ alkylene group, a halo-C₁-C₆ alkylene group, a C₂-C₆ alkenylene group, a halo-C₂-C₆ alkenylene group, a C₂-C₆ alkynylene group or a halo-C₃-C₆ alkynylene group;

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(i) when A⁶ is -C(=O)- or -SO₂-, then R¹⁴ is a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a phenyl group, a substituted phenyl group having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a cyano group, a nitro group, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₂-C₆ alkenyl group, a halo-C₂-C₆ alkenyl group, a C₂-C₆ alkynyl group, a halo-C₂-C₆ alkynyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfanyl group, a halo-C₁-C₆ alkylsulfanyl group, a C₁-C₆ alkylsulfonyl group, a halo-C₁-C₆ alkylsulfonyl group, a mono-C₁-C₆ alkylamino group and a di-C₁-C₆ alkylamino group which may be the same or different, or a group of the formula -A⁶-R¹⁴ (wherein A⁶ is -C(=O)-, -SO₂-, a C₁-C₆ alkylene group, a halo-C₁-C₆ alkylene group, a C₂-C₆ alkenylene group, a halo-C₂-C₆ alkenylene group, a C₂-C₆ alkynylene group or a halo-C₃-C₆ alkynylene group;

(ii) when A⁶ is a C₁-C₆ alkylene group, a halo-C₁-C₆ alkylene group, a C₂-C₆ alkenylene group, a halo-C₂-C₆ alkenylene group, a C₂-C₆ alkynylene group or a halo-C₃-C₆ alkynylene group, then R¹⁴ is a hydrogen atom, a halogen atom, a cyano group, a C₃-C₆ cycloalkyl group, a halo-C₃-C₆ cycloalkyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfanyl group, a halo-C₁-C₆ alkylsulfanyl group, a C₁-C₆ alkylsulfonyl group, a halo-C₁-C₆ alkylsulfonyl group, a C₁-C₆ alkylcarbonyl group, a halo-C₁-C₆ alkylcarbonyl group, a C₁-C₆ alkoxy carbonyl group, a phenyl group, a substituted phenyl group having at least one substituent which may be the same or different and are selected from the group consisting of a halogen atom, a cyano group, a nitro group, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₂-C₆ alkenyl group, a halo-C₂-C₆ alkenyl group, a C₂-C₆ alkynyl group, a halo-C₂-C₆ alkynyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfanyl group, a halo-C₁-C₆ alkylsulfanyl group, a C₁-C₆ alkylsulfonyl group, a halo-C₁-C₆ alkylsulfonyl group, a mono-C₁-C₆ alkylamino group and a di-C₁-C₆ alkylamino group which may be the same or different, a phenoxy group, a substituted phenoxy group having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a cyano group, a nitro group, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₂-C₆ alkenyl group, a halo-C₂-C₆ alkenyl group, a C₂-C₆ alkynyl group, a halo-C₂-C₆ alkynyl group, a C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfanyl group, a halo-C₁-C₆ alkylsulfanyl group, a C₁-C₆ alkylsulfonyl group, a halo-C₁-C₆ alkylsulfonyl group, a mono-C₁-C₆ alkylamino group and a di-C₁-C₆ alkylamino group which may be the same or different, a phenylthio group, a substituted phenylthio group having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a cyano group, a nitro group, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₂-C₆ alkenyl group, a halo-C₂-C₆ alkenyl group, a C₂-C₆ alkynyl group, a halo-C₂-C₆ alkynyl group, a C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfanyl group, a halo-C₁-C₆ alkylsulfanyl group, a C₁-C₆ alkylsulfonyl group, a halo-C₁-C₆ alkylsulfonyl group, a mono-C₁-C₆ alkylamino group and a di-C₁-C₆ alkylamino group which may be the same or different, a phenylthio group;

group, a substituted phenylthio group having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a cyano group, a nitro group, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₂-C₆ alkenyl group, a halo-C₂-C₆ alkenyl group, a C₂-C₆ alkynyl group, a halo-C₂-C₆ alkynyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a mono-C₁-C₆ alkylamino group and a di-C₁-C₆ alkylamino group which may be the same or different, a naphthyl group, a substituted naphthyl group having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a cyano group, a nitro group, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₂-C₆ alkenyl group, a halo-C₂-C₆ alkenyl group, a C₂-C₆ alkynyl group, a halo-C₂-C₆ alkynyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a mono-C₁-C₆ alkylamino group and a di-C₁-C₆ alkylamino group which may be the same or different, a heterocyclic group (which is the same as defined above), or a substituted heterocyclic group (wherein the heterocyclic group is the same as defined above) having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a cyano group, a nitro group, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₂-C₆ alkenyl group, a halo-C₂-C₆ alkenyl group, a C₂-C₆ alkynyl group, a halo-C₂-C₆ alkynyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a mono-C₁-C₆ alkylamino group and a di-C₁-C₆ alkylamino group which may be the same or different, a heterocyclic group (which is the same as defined above), or a substituted heterocyclic group (wherein the heterocyclic group is the same as defined above) having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a cyano group, a nitro group, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₂-C₆ alkenyl group, a halo-C₂-C₆ alkenyl group, a C₂-C₆ alkynyl group, a halo-C₂-C₆ alkynyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a mono-C₁-C₆ alkylamino group and a di-C₁-C₆ alkylamino group which may be the same or different));

n is an integer of 1 to 4;

further, X may form a condensed ring (which means naphthalene, tetrahydronaphthalene, indene, indane, quinoline, quinazoline, chroman, isochroman, indole, indoline, benzodioxane, benzodioxole, benzofuran, dihydrobenzofuran, benzothiophene, dihydrobenzothiophene, benzoxazole, benzothiazole, benzimidazole or indazole), by combining together with the adjacent carbon atoms in the phenyl ring, and said condensed ring may have at least one substituents, which may be the same or different, and selected from the group consisting of a halogen atom, a cyano group, a nitro group, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₂-C₆ alkenyl group, a halo-C₂-C₆ alkenyl group, a C₂-C₆ alkynyl group, a halo-C₂-C₆ alkynyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group, a halo-C₁-C₆ alkylsulfonyl group, a mono-C₁-C₆ alkylamino group, a di-C₁-C₆ alkylamino group which may be the same or different, a phenyl group, a substituted phenyl group having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a cyano group, a nitro group, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₂-C₆ alkenyl group, a halo-C₂-C₆ alkenyl group, a C₂-C₆ alkynyl group, a halo-C₂-C₆ alkynyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group, a halo-C₁-C₆ alkylsulfonyl group, a mono-C₁-C₆ alkylamino group and a di-C₁-C₆ alkylamino group which may be the same or different, a naphthyl group, a substituted naphthyl group having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a cyano group, a nitro group, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₂-C₆ alkenyl group, a halo-C₂-C₆ alkenyl group, a C₂-C₆ alkynyl group, a halo-C₂-C₆ alkynyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group, a halo-C₁-C₆ alkylsulfonyl group, a mono-C₁-C₆ alkylamino group and a di-C₁-C₆ alkylamino group which may be the same or different, a heterocyclic group (which is the same as defined above), and a substituted heterocyclic group (wherein the heterocyclic group is the same as defined above) having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a cyano group, a nitro group, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₂-C₆ alkenyl group, a halo-C₂-C₆ alkenyl group, a C₂-C₆ alkynyl group, a halo-C₂-C₆ alkynyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group, a halo-C₁-C₆ alkylsulfonyl group, a mono-C₁-C₆ alkylamino group and a di-C₁-C₆ alkylamino group which may be the same or different);

alkylamino group and a di-C₁-C₆ alkylamino group which may be the same or different; Z¹ and Z² are each represents an oxygen atom or a sulfur atom; provided that,

- 5 (1) when X, R¹ and R³ are hydrogen atoms at the same time; m is an integer of 2; Y at 2-position is a fluorine atom and Y at 3-position is a chlorine atom; then R² is not ethyl group, isopropyl group, cyclohexyl group, 2-propenyl group, methylthiopropyl group and α-methylbenzyl group,
- 10 (2) when X and R³ are hydrogen atoms at the same time; m is an integer of 2; Y at 2-position is a fluorine atom and Y at 3-position is a chlorine atom; then the 4 to 7 membered ring by combining R¹ and R² to each other, in which the ring may contain the same or different 1 to 3 hetero atoms selected from the group consisting of oxygen atom, sulfur atom and nitrogen atom is not morpholino group,
- 15 (3) when X, R¹ and R³ are hydrogen atoms at the same time; and R² is 1,2,2-trimethylpropyl group; then Y is not a hydrogen atom,
- (4) when X, R¹ and R³ are hydrogen atoms at the same time; R² is 2,2-dimethylpropyl group; and m is an integer of 1; then Y is not 2-ethoxy group, and
- 20 (5) when X, R¹ and R³ are hydrogen atoms at the same time; and R² is *tert*-butyl group group; and m is an integer of 1; then Y is not 4-chlorine atom, 2-nitro group, 4-nitro group, 3-methoxy group, 4-methoxy group and 2,6-dimethyl groups;

20 agricultural and horticultural insecticides containing as an active ingredient any of the phthalic acid diamide derivatives of the general formula (I) including known compounds; and a method for application of the insecticides.

[0005] In the definition of the general formula (I) representing the phthalic acid diamide derivative of the present invention, the halogen atom includes chlorine atom, bromine atom, iodine atom and fluorine atom. The term "C₁-C₆ alkyl"

25 means a linear or branched alkyl group of 1 to 8 carbon atoms, such as methyl, ethyl, n-propyl, i-propyl, n-butyl, i-butyl, s-butyl, t-butyl, n-pentyl, n-hexyl, or the like. The term "C₁-C₈ alkylene" means a linear or branched alkylene group of 1 to 8 carbon atoms, such as methylene, ethylene, propylene, trimethylene, dimethylmethylen, tetramethylene, i-butylene, dimethylethylene, pentamethylene, hexamethylene, heptamethylene, octamethylene or the like. The term "halo-C₁-C₆ alkyl" means a substituted and linear or branched alkyl group of 1 to 6 carbon atoms having as the substituent(s)

30 one or more halogen atoms which may be the same or different.

[0006] As the ring which R¹ and R² form by combining to each other, i.e., the 4- to 7-membered ring by combining to each other, in which the ring may contain the same or different 1 to 3 hetero atoms selected from the group consisting of oxygen atom, sulfur atom and nitrogen atom, there can be exemplified azetidine ring, pyrrolidine ring, pyrrolidine ring, piperidine ring, imidazolidine ring, imidazoline ring, oxazolidine ring, thiazolidine ring, isoxazolidine ring, isothiazolidine

35 ring, tetrahydropyridine ring, piperazine ring, morpholine ring, thiomorpholine ring, dioxazine ring, dithiazine ring, etc. [0007] The phthalic acid diamide derivative of the general formula (I) of the present invention contains an asymmetric carbon atom or some asymmetric center in the structural formula in some cases or has two optical isomers in some cases. The present invention includes these optical isomers and all mixtures containing the optical isomers in arbitrary proportions.

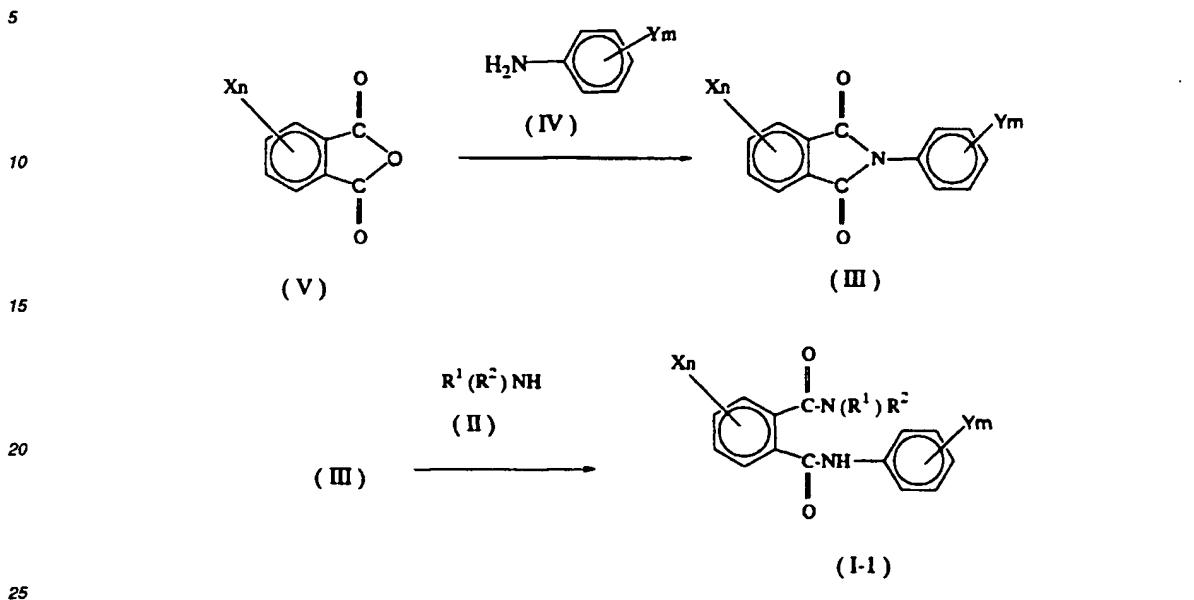
40 [0008] Preferable examples of each substituent of the phthalic acid diamide derivative of the general formula (I) of the present invention are as follows. Preferable examples of each of R¹ and R² which may be the same or different are hydrogen atom, C₁-C₆ alkyl groups such as methyl, ethyl, i-propyl, etc. Preferable examples of R³ are hydrogen atom, and C₁-C₆ alkyl groups such as methyl, ethyl, n-propyl, i-propyl, n-butyl, etc. Preferable examples of x are halogen atoms, nitro group, halo-C₁-C₆ alkyl groups, halo-C₁-C₆ alkoxy groups, halo-C₁-C₆ alkylthio groups, etc. Preferable

45 examples of Y are halo-C₁-C₆ alkyl groups, halo-C₁-C₆ alkoxy groups, halo-C₁-C₆ alkylthio groups, etc.

[0009] The phthalic acid diamide derivative of the general formula (I) of the present invention can be produced, for example, by any of the processes illustrated below.

Production process 1.

[0010]



wherein R¹, R², X, n, Y and m are as defined above.

30 [0011] A phthalic anhydride derivative of the general formula (V) is reacted with an aniline of the general formula (IV) in the presence of an inert solvent to obtain a phthalimide derivative of the general formula (III). The phthalimide derivative (III) is reacted with an amine of the general formula (II) after or without being isolated, whereby a phthalic acid diamide derivative of the general formula (I-1) can be produced.

35 (1) General formula (V) → general formula (III)

[0012] As the inert solvent used in this reaction, any solvent may be used so long as it does not markedly inhibit the progress of the reaction. There can be exemplified aromatic hydrocarbons such as benzene, toluene, xylene, etc.; halogenated hydrocarbons such as dichloromethane, chloroform, carbon tetrachloride, etc., chlorinated aromatic hydrocarbons such as chlorobenzene, dichlorobenzene, etc.; a cyclic or cyclic ethers such as diethyl ether, dioxane, tetrahydrofuran, etc.; esters such as ethyl acetate, etc.; amides such as dimethylformamide, dimethylacetamide, etc.; acids such as acetic acid, etc.; dimethyl sulfoxide; and 1,3-dimethyl-2-imidazolidinone. These inert solvents may be used alone or as a mixture thereof.

40 [0013] Since the reaction is an equimolar reaction, it is sufficient that the reactants are used in equimolar amounts, though either of them may be used in excess. If necessary, the reaction may be carried out under dehydrating conditions.

[0014] As to the reaction temperature, the reaction can be carried out in a temperature range of room temperature to the reflux temperature of the inert solvent used. Although the reaction time is varied depending on the scale of reaction, the reaction temperature, etc., it may be properly chosen in a range of several minutes to 48 hours.

45 [0015] After completion of the reaction, the desired compound is isolated from the reaction solution containing the desired compound by a conventional method, and if necessary, purified by recrystallization, column chromatography, etc., whereby the desired compound can be produced. The desired compound can be subjected to the subsequent reaction without isolation from the reaction solution.

[0016] The phthalic anhydride derivative of the general formula (V) can be produced by the process described in J. Org. Chem., 52, 129 (1987), J. Am. Chem. Soc., 51, 1865 (1929), J. Am. Chem. Soc., 63, 1542 (1941), etc. The aniline of the general formula (IV) can be produced by the process described in J. Org. Chem., 29, 1 (1964), Angew. Chem. Int. Ed. Engl., 24, 871 (1985), Synthesis, 1984, 667, Bulletin of the Chemical Society of Japan, 1973, 2351, DE-2606982, JP-A-1-90163, etc.

(2) General formula (III) → general formula (I-1)

[0017] In this reaction, there can be used the inert solvents exemplified above as the inert solvent used in the reaction (1).

5 [0018] Since the reaction is an equimolar reaction, it is sufficient that the reactants are used in equimolar amounts, though the amine of the general formula (II) may be used in excess.

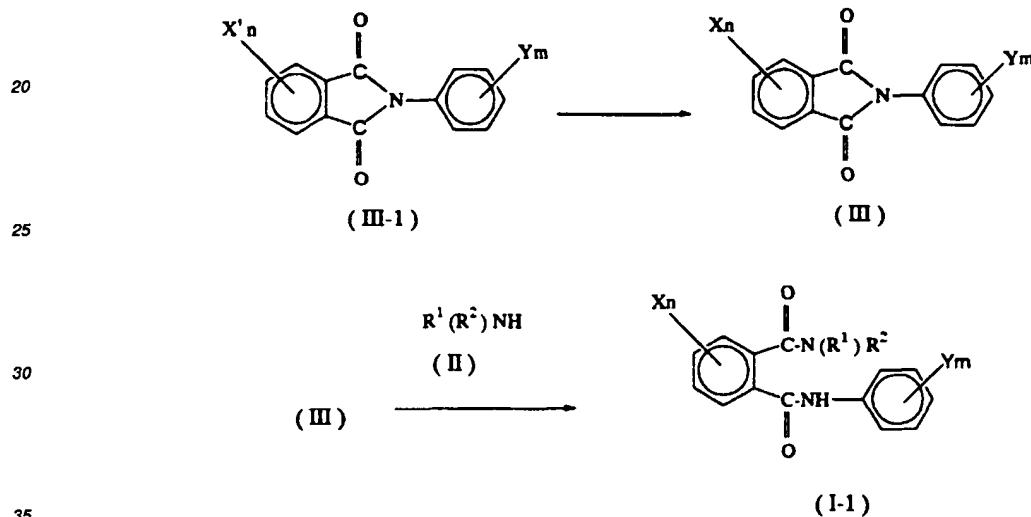
[0019] As to the reaction temperature, the reaction can be carried out in a temperature range of room temperature to the reflux temperature of the inert solvent used. Although the reaction time is varied depending on the scale of reaction, the reaction temperature, etc., it may be properly chosen in a range of several minutes to 48 hours.

10 [0020] After completion of the reaction, the desired compound is isolated from the reaction solution containing the desired compound by a conventional method, and if necessary, purified by recrystallization, column chromatography, etc., whereby the desired compound can be produced.

Production process 2.

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[0021]



40 wherein R^1 , R^2 , n , X , Y and m are as defined above, and X' is a halogen atom or a nitro group, provided that X is other than a hydrogen atom or a nitro group.

[0022] A phthalimide derivative of the general formula (III-1) is reacted with a reactant corresponding to X in the presence of an inert solvent to obtain a phthalimide derivative of the general formula (III). The phthalimide derivative (III) is reacted with an amine of the general formula (II) after or without being isolated, whereby a phthalic acid diamide derivative of the general formula (I-1) can be produced.

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(1) General formula (III-1) → general formula (III)

[0023] This reaction can be carried out according to the methods described in J. Org. Chem., 42, 3415 (1977), Tetrahedron, 25, 5921 (1969), Synthesis, 1984, 667, Chem. Lett., 1973, 471, J. Org. Chem., 39, 3318 (1974), J. Org. Chem., 39, 3327 (1974), etc.

(2) General formula (III) → general formula (I-1)

55 [0024] This reaction can be carried out according to production process 1-(2).

Production process 3

[0025]

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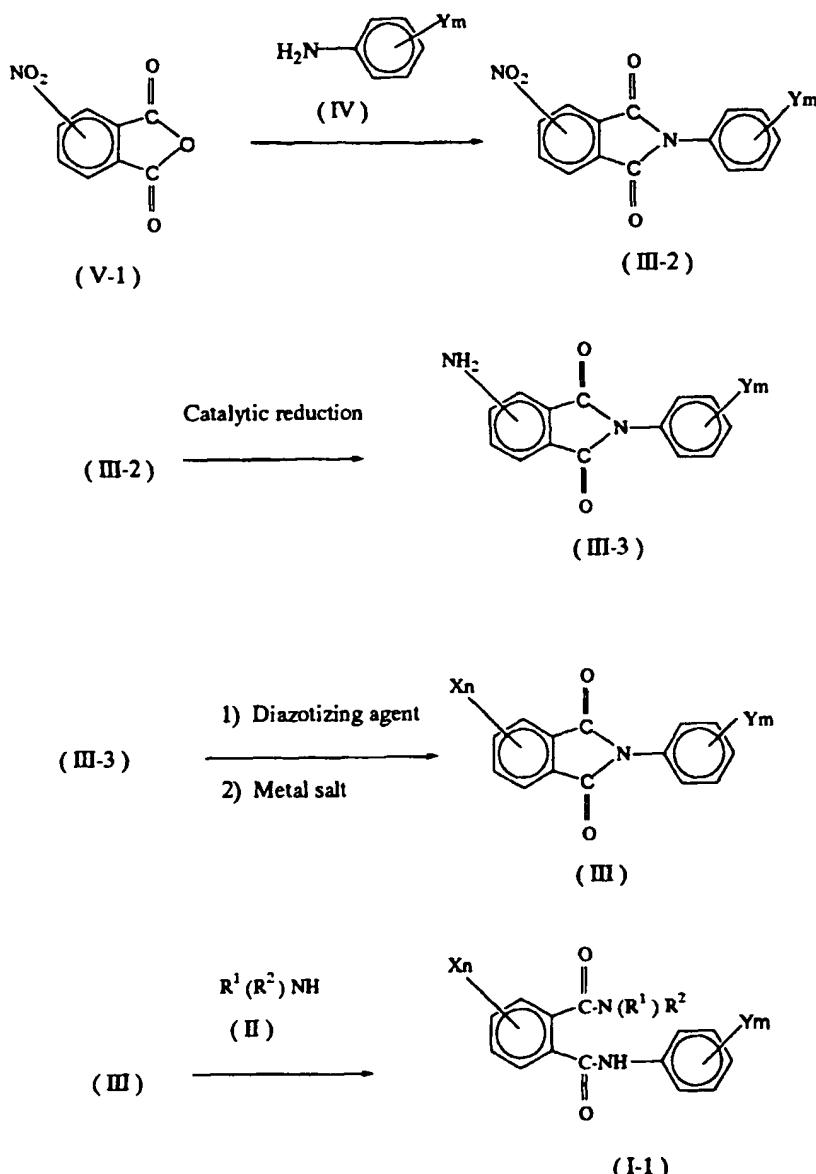
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50 wherein R^1 , R^2 , X , Y , m and n are as defined above.

[0026] A phthalic anhydride of the general formula (V-1) is reacted with an aniline of the general formula (IV) in the presence of an inert solvent to obtain a phthalimide derivative of the general formula (III-2). The phthalimide derivative (III-2) is subjected to catalytic reduction with hydrogen after or without isolation to obtain a phthalimide derivative of the general formula (III-3). The phthalimide derivative (III-3) is converted to a phthalimide derivative of the general formula (III) by adding a diazotizing agent and then a metal salt after or without isolation of the phthalimide derivative (III-3). The phthalimide derivative (III) is reacted with an amine of the general formula (II) after or without being isolated, whereby a phthalic acid diamide derivative of the general formula (I-1) can be produced.

(1) General formula (V-1) → general formula (III-2)

[0027] The desired compound can be produced by this reaction in the same manner as in production process 1-(1).

5 (2) General formula (III-2) → general formula (III-3)

[0028] Any solvent may be used in this reaction so long as it does not markedly inhibit the progress of the reaction. There can be exemplified alcohols such as methanol, ethanol, propanol, etc.; acyclic or cyclic ethers such as diethyl ether, dioxane, tetrahydrofuran, etc., and acids such as acetic acid, etc. These inert solvents may be used alone or as 10 a mixture thereof.

[0029] As the catalyst for catalytic reduction used in this reaction, there can be exemplified palladium carbon, Raney nickel, palladium black, platinum black, etc. The amount of the catalyst used may be properly chosen in a range of 0.1 to 10% by weight based on the weight of the phthalimide derivative of the general formula (III-2). This reaction is carried out under a hydrogen atmosphere and the hydrogen pressure may be properly chosen in a range of 1 to 10 atmospheric 15 pressure.

[0030] As to the reaction temperature, the reaction can be carried out in a temperature range of room temperature to the reflux temperature of the inert solvent used. Although the reaction time is varied depending on the scale of reaction, the reaction temperature, etc., it may be properly chosen in a range of several minutes to 48 hours.

[0031] After completion of the reaction, the desired compound is isolated from the reaction mixture containing the 20 desired compound by a conventional method, and if necessary, purified by recrystallization, column chromatography, etc., whereby the desired compound can be produced. The desired compound can be subjected to the subsequent reaction without isolation from the reaction mixture.

(3) General formula (III-3) → general formula (III)

[0032] In this reaction, an acidic solvent can be used as an inert solvent. The acidic solvent includes, for example, an aqueous hydrochloric acid solution, an aqueous hydrobromic acid solution, an aqueous hydroiodic acid solution, an aqueous sulfuric acid solution, acetic acid and trifluoroacetic acid. These acidic solvents may be used alone or as a mixture thereof. In addition, these acidic solvents may be used in admixture with ethers such as tetrahydrofuran, dioxane, 30 etc.

[0033] The diazotizing agent includes, for example, sodium nitrite, nitrosyl hydrogensulfate and alkyl nitrites. The amount of the diazotizing agent used may be properly chosen in a range of equal amount to excess amount relative to the amount of the phthalimide derivative of the general formula (III-3).

[0034] As to the reaction temperature, the reaction can be carried out in a temperature range of -50°C to the reflux 35 temperature of the inert solvent used. Although the reaction time is varied depending on the scale of reaction, the reaction temperature, etc., it may be properly chosen in a range of several minutes to 48 hours.

[0035] As the metal salt added after the production of a diazonium salt, there can be used, for example, cuprous chloride, cuprous bromide, potassium iodide, copper cyanide, potassium xanthate and sodium thiorate. The amount of the metal salt used may be properly chosen in a range of 1 equivalent to excess equivalents per equivalent of the phthalim- 40 ide derivative of the general formula (III-3).

[0036] After completion of the reaction, the desired compound is isolated from the reaction mixture containing the desired compound by a conventional method, and if necessary, purified by recrystallization, column chromatography, etc., whereby the desired compound can be produced. The desired compound can be subjected to the subsequent reaction without isolation from the reaction mixture.

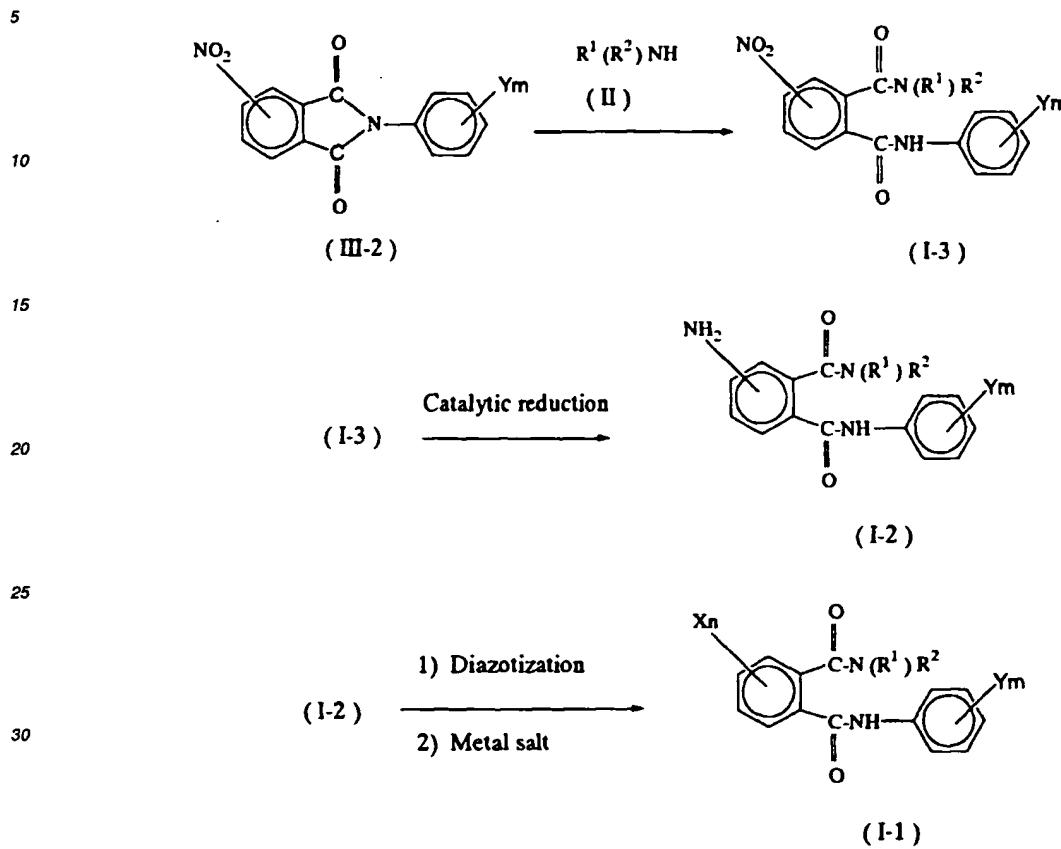
[0037] The reaction can be carried out according to the method described in Org. Synth., IV, 160 (1963), Org. Synth., III, 809 (1959), J. Am. Chem. Soc., 92, 3520 (1970), etc.

(4) General formula (III) → general formula (I-1)

[0038] The desired compound can be produced by this reaction in the same manner as in production process 1-(2).

Production process 4.

[0039]



wherein R¹, R², X, Y, m and n are as defined above.

40 [0040] A phthalimide derivative of the general formula (III-2) is reacted with an amine of the general formula (II) in the presence of an inert solvent to obtain a phthalic acid diamide derivative of the general formula (I-3). The phthalic acid diamide derivative (I-3) is subjected to catalytic reduction with hydrogen after or without isolation to obtain a phthalic acid diamide derivative of the general formula (I-2). A phthalic acid diamide derivative of the general formula (I-1) can be produced from the phthalic acid diamide derivative (I-2) by adding a diazotizing agent and then a metal salt after or without isolating the phthalic acid diamide derivative (I-2).

(1) General formula (III-2) → general formula (I-3)

[0041] The desired compound can be produced by this reaction in the same manner as in production process 1-(2).

(2) General formula (I-3) \rightarrow general formula (I-2)

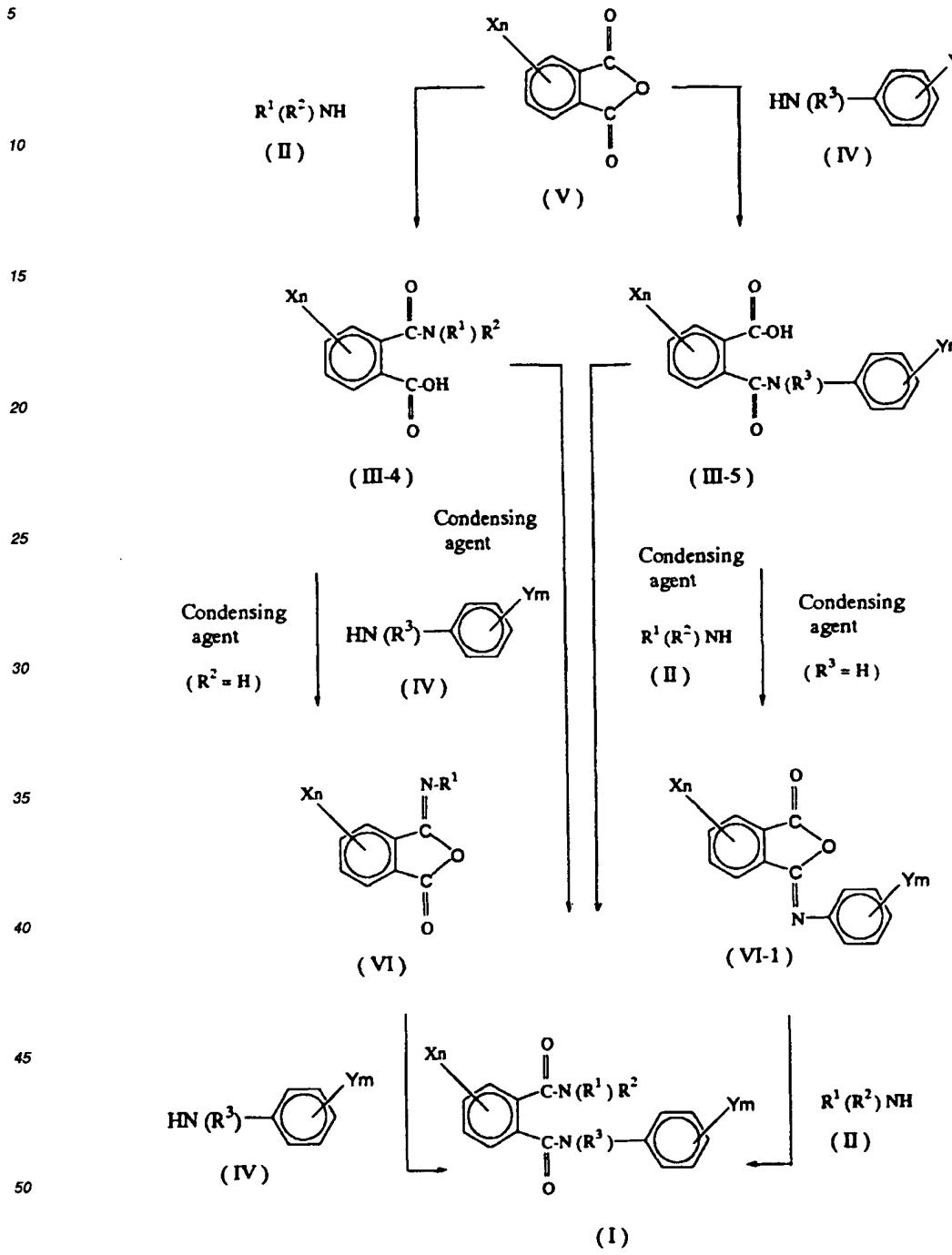
[0042] The desired compound can be produced by this reaction in the same manner as in production process 3-(2).

55 (3) General formula (I-2) \rightarrow general formula (I-1)

[0043] The desired compound can be produced by this reaction in the same manner as in production process 3-(3)

Production process 5.

[0044]

wherein R^1 , R^2 , R^3 , X, n, Y and m are as defined above.

[0045] A phthalic anhydride derivative of the general formula (V) is reacted with an amine of the general formula (II)

in the presence of an inert solvent to obtain a phthalamide of the general formula (III-4). The phthalamide (III-4) is treated as follows after or without isolation. When R² of the phthalamide (III-4) is a hydrogen atom, the phthalamide (III-4) is condensed into a compound of the general formula (VI) in the presence of a condensing agent, and the compound (VI) is reacted with an aniline of the general formula (IV) in the presence of an inert solvent after or without being isolated. When R² of the phthalamide (III-4) is other than a hydrogen atom, the phthalamide (III-4) is condensed with an aniline of the general formula (IV) in the presence of a condensing agent. Thus, a phthalic acid diamide derivative of the general formula (I) can be produced.

[0046] Alternatively, a phthalic anhydride derivative of the general formula (V) is reacted with an aniline of the general formula (IV) in the presence of an inert solvent to obtain a phthalanilide of the general formula (III-5). The phthalanilide (III-5) is treated as follows after or without isolation. When R³ of the phthalanilide (III-5) is a hydrogen atom, the phthalanilide (III-5) is condensed into a compound of the general formula (VI-1) in the presence of a condensing agent, and the compound (VI-1) is reacted with an amine of the general formula (II) in the presence of an inert solvent after or without being isolated. When R³ of the phthalanilide (III-5) is other than a hydrogen atom, the phthalanilide (III-5) is condensed with an amine of the general formula (II) in the presence of a condensing agent. Thus, a phthalic acid diamide derivative of the general formula (I) can be produced.

(1) General formula (V) or general formula (VI-1) → general formula (III-4) or general formula (I), respectively

[0047] The desired compound can be produced by this reaction in the same manner as in production process 1-(2).

(2) General formula (III-4) or general formula (III-5) → general formula (VI) or general formula (VI-1), respectively

[0048] The desired compound can be produced by this reaction according to the method described in J. Med. Chem., 10, 982 (1967).

(3) General formula (VI) or general formula (V) → general formula (I) or general formula (III-5), respectively

[0049] The desired compound can be produced by this reaction in the same manner as in production process 1-(2).

(4) General formula (III-4) or general formula (III-5) → general formula (I)

[0050] The desired compound can be produced by reacting the phthalamide derivative of the general formula (III-4) or the general formula (III-5) with the aniline of the general formula (IV) or the amine of the general formula (II), respectively, in the presence of a condensing agent and an inert solvent. If necessary, the reaction can be carried out in the presence of a base.

[0051] The inert solvent used in the reaction includes, for example, tetrahydrofuran, diethyl ether, dioxane, chloroform and dichloromethane. As the condensing agent used in the reaction, any condensing agent may be used so long as it is used in usual amide synthesis. The condensing agent includes, for example, Mukaiyama reagent (e.g. 2-chloro-N-methylpyridinium iodide), 1,3-dicyclohexylcarbodiimide (DCC), carbonyldiimidazole (CDI) and diethyl phosphorocyanide (DEPC). The amount of the condensing agent used may be properly chosen in a range of 1 mole to excess moles per mole of the phthalamide derivative of the general formula (III-4) or the general formula (III-5).

[0052] As the base usable in the reaction, there can be exemplified organic bases such as triethylamine, pyridine, etc. and inorganic bases such as potassium carbonate, etc. The amount of the base used may be properly chosen in a range of 1 mole to excess moles per mole of the phthalamide derivative of the general formula (III-4) or the general formula (III-5).

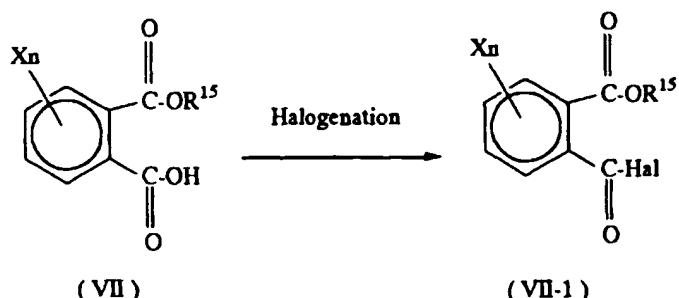
[0053] As to the reaction temperature, the reaction can be carried out in a temperature range of 0°C to the boiling point of the inert solvent used. Although the reaction time is varied depending on the scale of reaction, the reaction temperature, etc., it ranges from several minutes to 48 hours.

[0054] After completion of the reaction, the desired compound is isolated from the reaction solution containing the desired compound by a conventional method, and if necessary, purified by recrystallization, column chromatography, etc., whereby the desired compound can be produced.

Production process 6

[0055]

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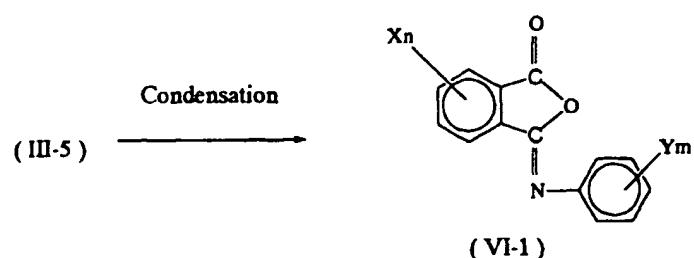
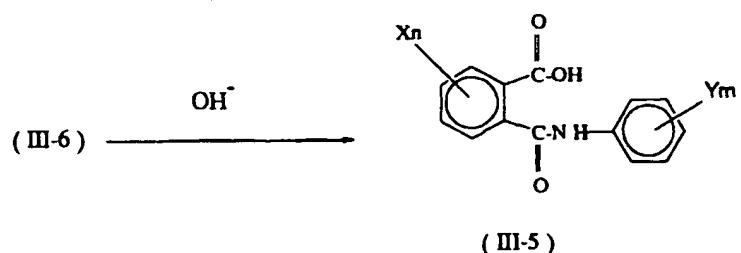
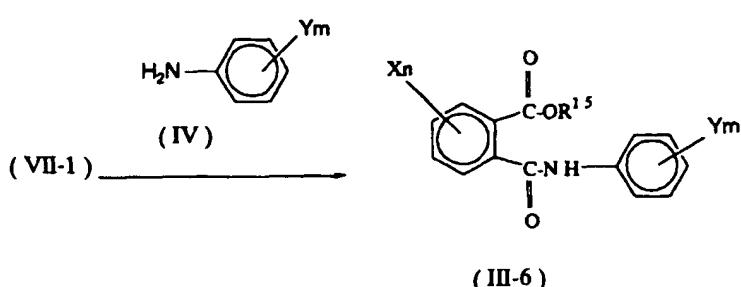
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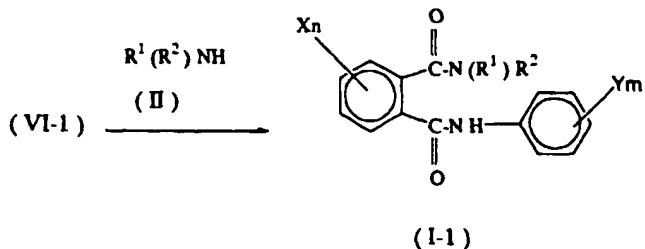
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wherein R¹, R², X, n, Y and m are as defined above, Hal is a halogen atom, and R¹⁵ is a (C₁-C₃)alkyl group.

[0056] A phthalic acid ester derivative of the general formula (VII) is halogenated into a phthaloyl halide of the general formula (VII-1) in the presence or absence of an inert solvent. The phthaloyl halide (VII-1) is reacted with an aniline of the general formula (IV) in the presence of an inert solvent and a base after or without being isolated, to obtain a phthalanilide of the general formula (III-6). The phthalanilide (III-6) is hydrolyzed into a phthalanilide of the general formula (III-5) in the presence or absence of an inert solvent after or without being isolated. The phthalanilide (III-5) is condensed into a phthalic anhydride derivative of the general formula (VI-1) after or without being isolated. The phthalic anhydride derivative (VI-1) is reacted with an amine of the general formula (II), whereby a phthalic acid diamide derivative of the general formula (I-1) can be produced.

(1) General formula (VII) → general formula (VII-1)

25 [0057] As the inert solvent usable in this reaction, any solvent may be used so long as it does not markedly inhibit the progress of the reaction. There can be exemplified aromatic hydrocarbons such as benzene, toluene, xylene, etc.; halogenated hydrocarbons such as dichloromethane, chloroform, carbon tetrachloride, etc., chlorinated aromatic hydrocarbons such as chlorobenzene, dichlorobenzene, etc.; acyclic or cyclic ethers such as diethyl ether, dioxane, tetrahydrofuran, etc., and esters such as ethyl acetate, etc. These inert solvents may be used alone or as a mixture thereof.

30 [0058] As the halogenating agents, there can be used, for example, thionyl chloride, phosphoryl chloride, and phosphorus trichloride. The amount of the halogenating agent used may be properly chosen in a range of 1 to 10 equivalents per equivalent of the phthalic acid ester of the general formula (VII).

35 [0059] As to the reaction temperature, the reaction can be carried out in a temperature range of 0°C to the reflux temperature of the inert solvent used. Although the reaction time is varied depending on the scale of reaction, the reaction temperature, etc., it may be properly chosen in a range of several minutes to 48 hours.

40 [0060] After completion of the reaction, the desired compound is isolated from the reaction solution containing the desired compound by a conventional method, and if necessary, purified by recrystallization, column chromatography, etc., whereby the desired compound can be produced. The desired compound can be subjected to the subsequent reaction without isolation from the reaction solution.

[0061] The phthalic acid ester of the general formula (VII) can be produced, for example, by the process described in J. Med. Chem., 31, 1466 (1988).

(2) General formula (VII-1) \rightarrow general formula (III-6)

[0062] As the inert solvent used in this reaction, there may be used, for example, the inert solvents exemplified in production process 1-(1).

[0063] As the base, an inorganic base or an organic base may be used. As the inorganic base, there may be used, for example, hydroxides of alkali metals, such as sodium hydroxide, potassium hydroxide, etc. As the organic base, there may be used triethylamine, pyridine, etc. The amount of the base used may be properly chosen in a range of 0.5 to 3 equivalents per equivalent of the phthaloyl halide of the general formula (VII-1).

[0064] Since the reaction is an equimolar reaction, it is sufficient that the reactants are used in equimolar amounts, though the amount of the aniline of the general formula (IV) used may be properly chosen in a range of 0.5 to 2 equivalents per equivalent of the phthaloyl halide of the general formula (VII-1).

[0065] As to the reaction temperature, the reaction can be carried out in a temperature range of 0°C to the reflux temperature of the inert solvent used. Although the reaction time is varied depending on the scale of reaction, the reaction temperature, etc., it may be properly chosen in a range of several minutes to 48 hours.

[0066] After completion of the reaction, the desired compound is isolated from the reaction solution containing the

desired compound by a conventional method, and if necessary, purified by recrystallization, column chromatography, etc., whereby the desired compound can be produced. The desired compound can be subjected to the subsequent reaction without isolation from the reaction solution.

5 (3) General formula (III-6) → general formula (III-5)

[0067] As the inert solvent usable in this reaction, there may be used water, alcohols (e.g. methanol, ethanol and propanol) as water-soluble solvents, and mixed solvents of water and a water-soluble solvent.

10 [0068] As the base used for the hydrolysis, there may be used, for example, hydroxides of alkali metals, such as sodium hydroxide, potassium hydroxide, etc. The amount of the base used may be properly chosen in a range of 1 to 10 equivalents per equivalent of the phthalanilide of the general formula (III-6).

[0069] As to the reaction temperature, the reaction can be carried out in a temperature range of 0°C to the reflux temperature of the inert solvent used. Although the reaction time is varied depending on the scale of reaction, the reaction temperature, etc., it may be properly chosen in a range of several minutes to 48 hours.

15 [0070] After completion of the reaction, the desired compound is isolated from the reaction solution containing the desired compound by a conventional method, and if necessary, purified by recrystallization, column chromatography, etc., whereby the desired compound can be produced. The desired compound can be subjected to the subsequent reaction without isolation from the reaction solution.

20 (4) General formula (III-5) → general formula (VI-1)

[0071] The desired compound can be produced by this reaction according to production process 5-(2).

(5) General formula (VI-1) → general formula (I-1)

25 [0072] The desired compound can be produced by this reaction according to production process 1-(2).

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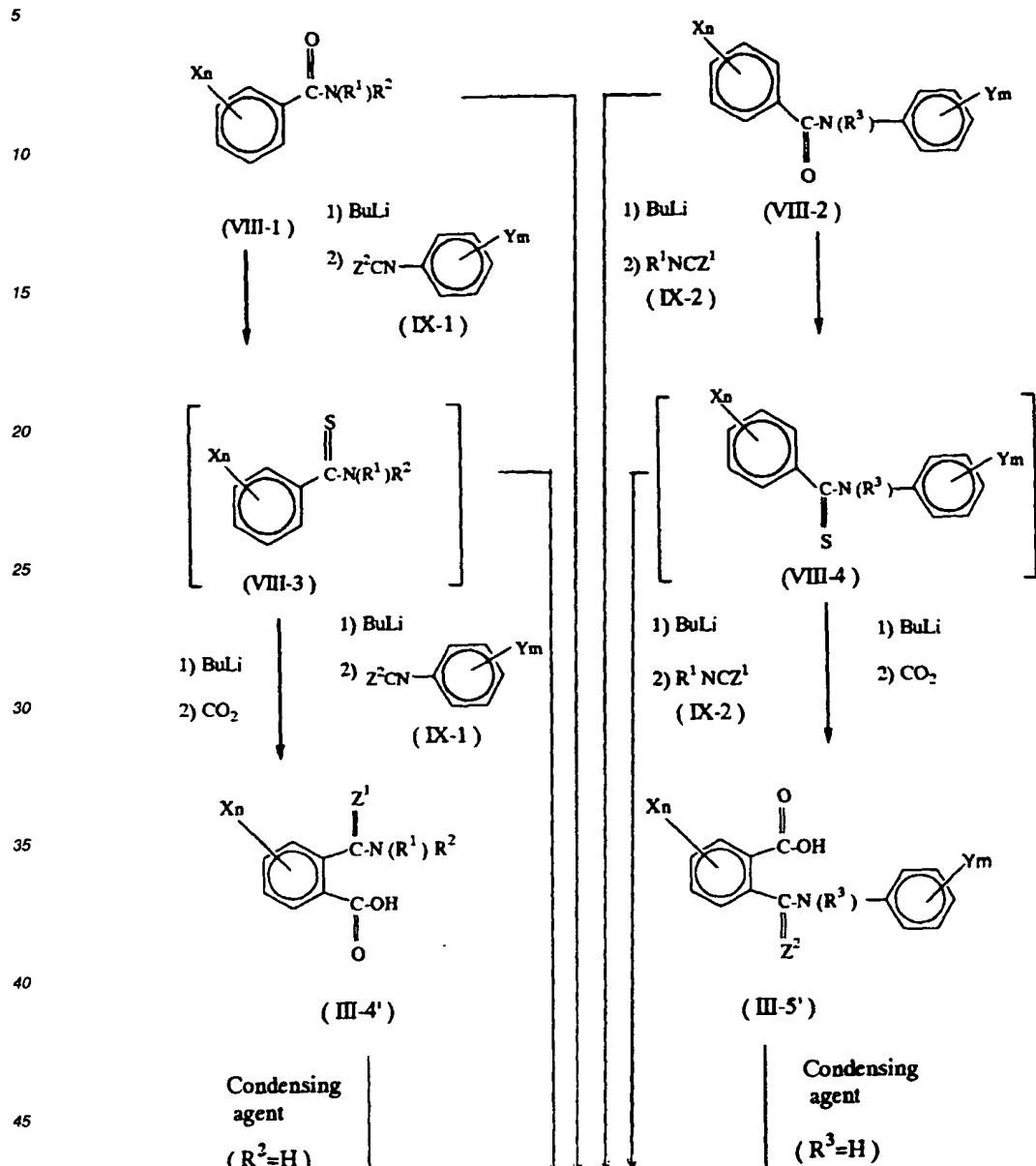
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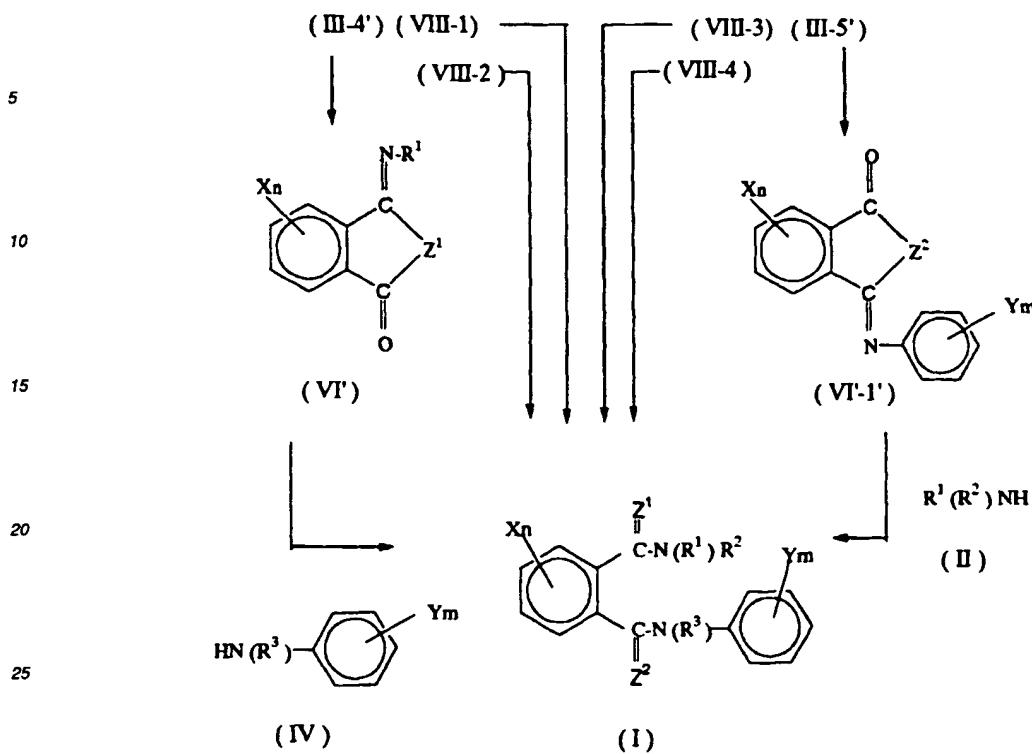
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Production process 7.

[0073]





wherein R¹, R², R³, X, Y, m, n, Z¹ and Z² are as defined above.

[0074] A benzamide derivative of the general formula (VIII-1) or the general formula (VIII-2) or a thiobenzamide derivative of the general formula (VIII-3) or the general formula (VIII-4) obtained by thiocarbonylation of the benzamide derivative of the general formula (VIII-1) or the general formula (VIII-2), respectively, is subjected to ortho-metallation by using a metal reagent such as butyllithium. The compound thus obtained is directly reacted with an isocyanate or isothiocyanate derivative of the general formula (IX-1) or (IX-2), or the compound is reacted with carbon dioxide to obtain a phthalamide derivative of the general formula (III-4) or the general formula (III-5'), which is treated in the same manner as in production processes 5-(1) to 5-(4). Thus, a phthalic acid diamide derivative of the general formula (I) can be produced.

[0075] The desired compound can be produced by this reaction according to the method described in J. Org. Chem., 46, 3558 (1981).

[0076] In this step, the benzamide derivative of the general formula (VIII-1) or the general formula (VIII-2) or the thiobenzamide derivative of the general formula (VIII-3) or the general formula (VIII-4) obtained by thiocarbonylation of the benzamide derivative of the general formula (VIII-1) or the general formula (VIII-2), respectively, is subjected to ortho-lithiation according to the method described in J. Org. Chem., 29, 853 (1964). The compound thus obtained is reacted with the isocyanate or isothiocyanate derivative of the general formula (IX-1) or (IX-2) at -80°C to room temperature, whereby the desired compound can be produced.

[0077] After completion of the reaction, the desired compound is isolated from the reaction solution containing the desired compound by a conventional method, and if necessary, purified by recrystallization, column chromatography, etc., whereby the desired compound can be obtained.

(3) General formula (VIII-1), general formula (VIII-2), general formula (VIII-3) or general formula (VIII-4) → general formula (III-4) or the general formula (III-5)

[0078] In this step, the desired compound can be produced by carrying out the same ortho-lithiation as in the above step (2) and introducing carbon dioxide into the ortho-lithiation product at -80°C to room temperature.

[0079] After completion of the reaction, the desired compound is isolated from the reaction solution containing the desired compound by a conventional method, and if necessary, purified by recrystallization, column chromatography, etc., whereby the desired compound can be obtained.

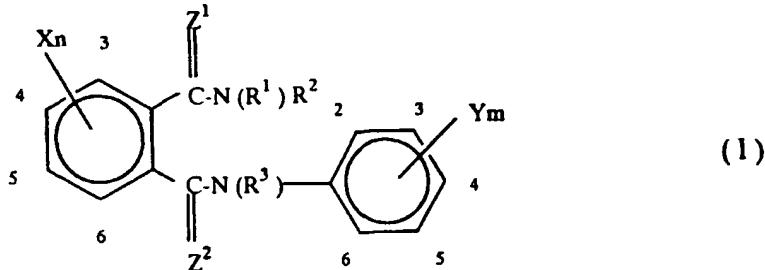
10 (4) General formula (III-4) or general formula (III-5') → general formula (I)

[0080] In this step, the desired compound can be produced in the same manner as in production process 1-(2) or 5-(4).

15 [0081] Tables 1 and 2 show typical examples of the phthalic acid diamide derivative of the general formula (I) used as the active ingredient of the agricultural and horticultural insecticide of the present invention, but the examples are not intended in any way to limit the scope of the present invention.

General formula (I):

20 [0082]



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[Table 1]

Table 1 ($z^1, z^2 = 0$)

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No	R ¹	R ²	R ³	Xn	Ym	Physical Properties (melting point: °C)
1	H	H	H	3-NO ₂	2-CH ₃ -5-Cl	173-175
2	CH ₃	H	H	H	4-CF ₃	129-131
3	CH ₃	H	H	3-NO ₂	2-CH ₃ -5-Cl	169-171
4	CH ₃	H	H	3-NO ₂	2-CH ₃ -4-OCHF ₂	167-169
5	CH ₃	CH ₃	H	6-NO ₂	2-CH ₃ -5-Cl	171-173
6	CH ₃	CH ₃	H	6-NO ₂	2-CH ₃ -4-OCHF ₂	167-169
7	C ₂ H ₅	H	H	H	4-CF ₃	134-136
8	C ₂ H ₅	H	H	3-Cl	2-CH ₃ -4-OCHF ₂	179-180
9	C ₂ H ₅	H	H	6-Cl	2-CH ₃ -4-OCHF ₂	189-190
10	C ₂ H ₅	H	H	3-NO ₂	2-CH ₃ -5-Cl	175-177
11	C ₂ H ₅	H	H	3-NO ₂	2-CH ₃ -4-OCHF ₂	207-208

Table 1 (Cont'd)

No	R ¹	R ²	R ³	Xn	Ym	Physical Properties (melting point: °C)
12	C ₂ H ₅	C ₂ H ₅	H	H	4-CF ₃	148-150
13	C ₂ H ₅	C ₂ H ₅	H	3-NO ₂	2-CH ₃ -5-Cl	175-177
14	n-C ₃ H ₇	H	H	H	4-CF ₃	138-140
15	n-C ₃ H ₇	H	H	3-Cl	2-CH ₃ -4-OCHF ₂	171-173
16	n-C ₃ H ₇	H	H	6-Cl	2-CH ₃ -4-OCHF ₂	189-191
17	n-C ₃ H ₇	H	H	3-NO ₂	2-CH ₃ -4-OCHF ₂	184-186
18	n-C ₃ H ₇	H	H	3-NO ₂	2-CH ₃ -5-Cl	187-189
19	n-C ₃ H ₇	H	H	5-CF ₃	2,6-(C ₂ H ₅) ₂	230-232
20	i-C ₃ H ₇	H	H	H	H	192-194
21	i-C ₃ H ₇	H	H	H	2-NO ₂	198-200
22	i-C ₃ H ₇	H	H	H	4-NO ₂	139-141
23	i-C ₃ H ₇	H	H	H	4-F	199-201
24	i-C ₃ H ₇	H	H	H	2-CH ₃	191-193
25	i-C ₃ H ₇	H	H	H	4-CF ₃	198-200
26	i-C ₃ H ₇	H	H	H	3-CF ₃	174-176
27	i-C ₃ H ₇	H	H	H	4-CF ₂ CF ₂ CF ₃	237-238
28	i-C ₃ H ₇	H	H	H	4-(CF ₂) ₃ CF ₃	137-139
29	i-C ₃ H ₇	H	H	H	4-OCF ₃	155-157
30	i-C ₃ H ₇	H	H	H	4-OCF ₂ CHFOC ₃ F _{7-n}	220-222
31	i-C ₃ H ₇	H	H	H	3-SCF ₃	176-178
32	i-C ₃ H ₇	H	H	H	4-SCHF ₂	169-170
33	i-C ₃ H ₇	H	H	H	4-SCH ₂ CF ₃	166-167
34	i-C ₃ H ₇	H	H	H	4-SCF ₂ CHF ₂	169-170

Table 1 (Cont'd)

	No	R ¹	R ²	R ³	Xn	Ym	Physical Properties (melting point: °C)
5	35	i-C ₃ H ₇	H	H	H	4-S(CF ₂) ₃ CF ₃	159-161
10	36	i-C ₃ H ₇	H	H	H	4-SCF(CF ₃) ₂	145-147
15	37	i-C ₃ H ₇	H	H	H	4-SCF ₂ CBrF ₂	158-160
20	38	i-C ₃ H ₇	H	H	H	4-SOCF ₂ CBrF ₂	180-182
25	39	i-C ₃ H ₇	H	H	H	4-SO(CF ₂) ₃ CF ₃	192-193
30	40	i-C ₃ H ₇	H	H	H	4-SO ₂ CH ₂ CF ₃	169-170
35	41	i-C ₃ H ₇	H	H	H	2,3-Cl ₂	151-153
40	42	i-C ₃ H ₇	H	H	H	2,4-Cl ₂	162-164
45	43	i-C ₃ H ₇	H	H	H	3,4-F ₂	172-174
50	44	i-C ₃ H ₇	H	H	H	2,4-(CH ₃) ₂	162-163
55	45	i-C ₃ H ₇	H	H	H	2-Cl-4-CF ₃	197-199
60	46	i-C ₃ H ₇	H	H	H	2-Cl-4-CF(CF ₃) ₂	201-202
65	47	i-C ₃ H ₇	H	H	H	2-Cl-4-OCF ₃	151-153
70	48	i-C ₃ H ₇	H	H	H	2-Br-4-OCF ₃	146-147
75	49	i-C ₃ H ₇	H	H	H	2-CH ₃ -3-Cl	196-198
80	50	i-C ₃ H ₇	H	H	H	2-CH ₃ -4-Cl	180-182
85	51	i-C ₃ H ₇	H	H	H	2-CH ₃ -5-Cl	161-162
90	52	i-C ₃ H ₇	H	H	H	2-CH ₃ -4-Br	159-261
95	53	i-C ₃ H ₇	H	H	H	2-CH ₃ -5-F	168-170
100	54	i-C ₃ H ₇	H	H	H	2-CH ₃ -5-C ₄ H ₉ -t	203-204
105	55	i-C ₃ H ₇	H	H	H	2-CH ₃ -4-CF ₂ CF ₃	157-159
110	56	i-C ₃ H ₇	H	H	H	2-CH ₃ -4-CF ₂ CF ₂ CF ₃	177-178
115	57	i-C ₃ H ₇	H	H	H	2-CH ₃ -4-CF(CF ₃) ₂	230-231

Table 1 (Cont'd)

	No	R ¹	R ²	R ³	Xn	Ym	Physical Properties (melting point: °C)
5	58	i-C ₃ H ₇	H	H	H	2-CH ₃ -4-OCHF ₂	135-137
10	59	i-C ₃ H ₇	H	H	H	2-CH ₃ -4-OCF ₃	172-173
15	60	i-C ₃ H ₇	H	H	H	2-CH ₃ -4-OCF ₂ CHF ₂	145-146
20	61	i-C ₃ H ₇	H	H	H	2-CH ₃ -3-OCF ₂ CHClF	172-174
25	62	i-C ₃ H ₇	H	H	H	2-CH ₃ -4-OCF ₂ CHClF	142-144
30	63	i-C ₃ H ₇	H	H	H	2-CH ₃ -4-CF ₂ CBrF ₂	164-166
35	64	i-C ₃ H ₇	H	H	H	2-CH ₃ -4-CF ₂ CCl ₂ F	172-173
40	65	i-C ₃ H ₇	H	H	H	2-CH ₃ -4-OCF ₂ CHFCF ₃	151-152
45	66	i-C ₃ H ₇	H	H	H	2-CH ₃ -4-OCF ₂ CBrFCF ₃	163-164
50	67	i-C ₃ H ₇	H	H	H	2-CH ₃ -4-OCF ₂ CHFOCF ₃	146-148
	68	i-C ₃ H ₇	H	H	H	2-CH ₃ -4-SC ₃ H ₇ -i	178-180
	69	i-C ₃ H ₇	H	H	H	2-CH ₃ -4-OCH ₂ OCH ₃	165-166
	70	i-C ₃ H ₇	H	H	H	2-CH ₃ -4-OCH ₂ SCH ₃	160-162
	71	i-C ₃ H ₇	H	H	H	2-CH ₃ -4-COOCH ₃	163-165
	72	i-C ₃ H ₇	H	H	H	2-CH ₃ -4-OCH ₂ COOCH ₃	121-122
	73	i-C ₃ H ₇	H	H	H	2-CH ₃ -4-(F ₅ -PhO)	185-187
	74	i-C ₃ H ₇	H	H	H	2-CH ₃ -4-(3-CF ₃ -PhO)	150-152
	75	i-C ₃ H ₇	H	H	H	2-CH ₃ -4-(2-Cl-4-CF ₃ -PhO)	183-185
	76	i-C ₃ H ₇	H	H	H	2-CH ₃ -4-(4-Cl-Ph-CH ₂ O)	188-189
	77	i-C ₃ H ₇	H	H	H	2-CH ₃ -4-(4-Cl-PhS)	181-182
	78	i-C ₃ H ₇	H	H	H	2-CH ₃ -4-(5-CF ₃ -2-Pyi-0)	165-167
	79	i-C ₃ H ₇	H	H	H	2-CH ₃ -4-(3-Cl-5-CF ₃ -2-Pyi-0)	184-185

Table 1 (Cont'd)

	No	R ¹	R ²	R ³	Xn	Ym	Physical Properties (melting point: °C)
10	80	i-C ₃ H ₇	H	H	H	4-(3-Cl-5-CF ₃ -2-Pyi-S)	173-175
	81	i-C ₃ H ₇	H	H	H	2-CH ₃ -4-P=O(OC ₂ H ₅) ₂	134-136
15	82	i-C ₃ H ₇	H	H	H	2-CH ₃ -4-OP=S(OCH ₃) ₂	132-134
	83	i-C ₃ H ₇	H	H	H	2-CF ₃ -4-OCHF ₂	147-149
20	84	i-C ₃ H ₇	H	H	H	3,5-Cl ₂ -4-OCHF ₂	183-185
	85	i-C ₃ H ₇	H	H	H	3-N=C(CF ₃)-NH-4	217-218
25	86	i-C ₃ H ₇	H	H	H	3-N=C(CF ₃)-N(CH ₃)-4	171-173
	87	i-C ₃ H ₇	H	H	3-Cl	4-C ₄ H ₉ -n	169-171
30	88	i-C ₃ H ₇	H	H	3-Cl	4-C ₄ H ₉ -t	224-226
	89	i-C ₃ H ₇	H	H	3-Cl	4-CF(CF ₃) ₂	198-200
35	90	i-C ₃ H ₇	H	H	3-Cl	4-CF ₂ CF ₂ CF ₃	203-204
	91	i-C ₃ H ₇	H	H	3-Cl	4-(CF ₂) ₃ CF ₃	176-178
40	92	i-C ₃ H ₇	H	H	3-Cl	4-OCHF ₂	205-207
	93	i-C ₃ H ₇	H	H	3-Cl	4-OCF ₂ CHFOC ₃ F,-n	169-171
45	94	i-C ₃ H ₇	H	H	3-Cl	4-SCH ₃	231-232
	95	i-C ₃ H ₇	H	H	6-Cl	4-SCH ₃	193-195
50	96	i-C ₃ H ₇	H	H	3-Cl	4-SOCH ₃	178-182
	97	i-C ₃ H ₇	H	H	3-Cl	4-SO ₂ CH ₃	208-210
55	98	i-C ₃ H ₇	H	H	3-Cl	4-SCHF ₂	220-222
	99	i-C ₃ H ₇	H	H	3-Cl	3-SCF ₃	189-191
60	100	i-C ₃ H ₇	H	H	3-Cl	3-SOCF ₃	183-187
	101	i-C ₃ H ₇	H	H	3-Cl	4-SCH ₂ CF ₃	191-193
65	102	i-C ₃ H ₇	H	H	3-Cl	4-SCF ₂ CHF ₂	198-200

Table 1 (Cont'd)

No	R ¹	R ²	R ³	Xn	Ym	Physical Properties (melting point: °C)
103	i-C ₃ H ₇	H	H	3-Cl	4-SCF ₂ CBrF ₂	201-203
104	i-C ₃ H ₇	H	H	3-Cl	4-SCF(CF ₃) ₂	221-223
105	i-C ₃ H ₇	H	H	3-Cl	4-S(CF ₂) ₃ CF ₃	199-200
106	i-C ₃ H ₇	H	H	3-Cl	4-SOCF(CF ₃) ₂	204-206
107	i-C ₃ H ₇	H	H	3-Cl	4-SO ₂ CH ₂ CF ₃	202-204
108	i-C ₃ H ₇	H	H	3-Cl	4-SO ₂ CF ₂ CHF ₂	227-230
109	i-C ₃ H ₇	H	H	3-Cl	4-COCH ₃	217-219
110	i-C ₃ H ₇	H	H	3-Cl	4-Ph	215-217
111	i-C ₃ H ₇	H	H	3-Cl	2,3-Cl ₂	168-169
112	i-C ₃ H ₇	H	H	3-Cl	2,4-Cl ₂	190-192
113	i-C ₃ H ₇	H	H	3-Cl	2,4-F ₂	188-190
114	i-C ₃ H ₇	H	H	3-Cl	2-Cl-4-F	172-173
115	i-C ₃ H ₇	H	H	3-Cl	2-F-4-Cl	181-182
116	i-C ₃ H ₇	H	H	3-Cl	2,3,4-F ₃	174-176
117	i-C ₃ H ₇	H	H	3-Cl	2,3-(CH ₃) ₂	187-189
118	i-C ₃ H ₇	H	H	3-Cl	2-CH ₃ -3-Cl	200-202
119	i-C ₃ H ₇	H	H	3-Cl	2-CH ₃ -4-Cl	213-215
120	i-C ₃ H ₇	H	H	3-Cl	2-CH ₃ -5-Cl	183-185
121	i-C ₃ H ₇	H	H	3-Cl	2-CH ₃ -4-Br	210-212
122	i-C ₃ H ₇	H	H	3-Cl	2-CH ₃ -4-I	206-208
123	i-C ₃ H ₇	H	H	3-Cl	2-CH ₃ -4-OCH ₃	191-192
124	i-C ₃ H ₇	H	H	3-Cl	2,3-(CH ₃) ₂ -4-OCH ₃	208-210
125	i-C ₃ H ₇	H	H	3-Cl	2-Cl-4-CF ₃	156-157

Table 1 (Cont'd)

	No	R ¹	R ²	R ³	Xn	Ym	Physical Properties (melting point: °C)
10	126	i-C ₃ H ₇	H	H	3-Cl	2-Cl-4-CF(CF ₃) ₂	204-206
	127	i-C ₃ H ₇	H	H	3-Cl	2-CH ₃ -4-CF ₃	219-220
15	128	i-C ₃ H ₇	H	H	3-Cl	2-CH ₃ -4-CF ₂ CF ₃	199-200
	129	i-C ₃ H ₇	H	H	3-Cl	2-CH ₃ -4-OCF ₂ CCl ₃	169-171
20	130	i-C ₃ H ₇	H	H	3-Cl	2-CH ₃ -4-CF ₂ CF ₂ CF ₃	214-215
	131	i-C ₃ H ₇	H	H	3-Cl	2-CH ₃ -4-CF(CF ₃) ₂	220-222
25	132	i-C ₃ H ₇	H	H	3-Cl	2-CH ₃ -4-(CF ₂) ₃ CF ₃	188-189
	133	i-C ₃ H ₇	H	H	3-Cl	2-CH ₃ -4-(CF ₂) ₅ CF ₃	161-163
30	134	i-C ₃ H ₇	H	H	3-Cl	3-Cl-4-OCHF ₂	197-199
	135	i-C ₃ H ₇	H	H	3-Cl	2-Cl-4-OCF ₃	158-159
35	136	i-C ₃ H ₇	H	H	3-Cl	2-Br-4-OCF ₃	169-170
	137	i-C ₃ H ₇	H	H	3-Cl	3-F-4-OCHF ₂	211-212
40	138	i-C ₃ H ₇	H	H	3-Cl	2-CH ₃ -4-OCHF ₂	193-195
	139	i-C ₃ H ₇	H	H	3-Cl	2-CH ₃ -4-OCF ₃	199-201
45	140	i-C ₃ H ₇	H	H	3-Cl	2-CH ₃ -4-OCBrF ₂	181-182
	141	i-C ₃ H ₇	H	H	3-Cl	2-CH ₃ -4-OCF ₂ CHF ₂	202-204
50	142	i-C ₃ H ₇	H	H	3-Cl	2-CH ₃ -3-OCF ₂ CHClF	169-171
	143	i-C ₃ H ₇	H	H	3-Cl	2-CH ₃ -4-OCF ₂ CHClF	194-196
55	144	i-C ₃ H ₇	H	H	3-Cl	2-CH ₃ -4-OCF ₂ CBrF ₂	193-194
	145	i-C ₃ H ₇	H	H	3-Cl	2-CH ₃ -4-OCF ₂ CCl ₂ F	202-203
60	146	i-C ₃ H ₇	H	H	3-Cl	2-CH ₃ -4-OCF ₂ CHFCF ₃	186-187
	147	i-C ₃ H ₇	H	H	3-Cl	2-CH ₃ -4-OCH ₂ CF ₂ CHF ₂	207-208
65	148	i-C ₃ H ₇	H	H	3-Cl	2-CH ₃ -4-OCF ₂ CBrFCF ₃	205-206

Table 1 (Cont'd)

	No	R ¹	R ²	R ³	Xn	Ym	Physical Properties (melting point: °C)
5	149	i-C ₃ H ₇	H	H	3-Cl	2-CH ₃ -4-OCF ₂ CHFOCF ₃	179-181
10	150	i-C ₃ H ₇	H	H	3-Cl	2-CH ₃ -4-OCHF ₂ -5-Cl	191-192
15	151	i-C ₃ H ₇	H	H	3-Cl	3,5-Cl ₂ -4-OCHF ₂	205-207
20	152	i-C ₃ H ₇	H	H	3-Cl	2-CH ₃ -4-OCF ₂ CHF ₂ -5-Cl	211-212
25	153	i-C ₃ H ₇	H	H	3-Cl	2-CH ₃ -4-SC ₃ H ₇ -i	189-191
30	154	i-C ₃ H ₇	H	H	3-Cl	2-CH ₃ -4-SCHF ₂	189-191
35	155	i-C ₃ H ₇	H	H	3-Cl	2-CH ₃ -4-SOCHF ₂	173-176
40	156	i-C ₃ H ₇	H	H	3-Cl	2-CH ₃ -4-SO ₂ CHF ₂	168-170
45	157	i-C ₃ H ₇	H	H	3-Cl	2-CH ₃ -4-(F ₅ -PhO)	224-226
50	158	i-C ₃ H ₇	H	H	3-Cl	2-CH ₃ -4-(5-CF ₃ -2-Pyi-0)	189-191
	159	i-C ₃ H ₇	H	H	3-Cl	2-CH ₃ -4-(3-Cl- 5-CF ₃ -2-Pyi-0)	204-205
	160	i-C ₃ H ₇	H	H	3-Cl	4-(3-Cl-5-CF ₃ -2-Pyi-S)	213-215
	161	i-C ₃ H ₇	H	H	3-Cl	2-CH ₃ -4-P=O(OC ₂ H ₅) ₂	71-73
	162	i-C ₃ H ₇	H	H	3-Cl	2-CH ₃ -4-OP=S(OCH ₃) ₂	168-170
	163	i-C ₃ H ₇	H	H	3-Cl	2-CF ₃ -4-OCHF ₂	194-196
	164	i-C ₃ H ₇	H	H	3-Cl	3-CF ₃ -4-OCHF ₂	208-209
	165	i-C ₃ H ₇	H	H	3-Cl	3-N=C(CF ₃)-O-4	248-250
	166	i-C ₃ H ₇	H	H	3-Cl	3-N=C(CF ₃)-NH-4	194-196
	167	i-C ₃ H ₇	H	H	3-Cl	3-N=C(CF ₃)-N(CH ₃)-4	225-227
	168	i-C ₃ H ₇	H	H	4-Cl	H	190-192
	169	i-C ₃ H ₇	H	H	4-Cl	4-F	213-215
	170	i-C ₃ H ₇	H	H	4-Cl	2-CH ₃	208-210

Table 1 (Cont'd)

	No	R ¹	R ²	R ³	Xn	Ym	Physical Properties (melting point: °C)
5	171	i-C ₃ H ₇	H	H	4-Cl	3-CF ₃	196-198
10	172	i-C ₃ H ₇	H	H	4-Cl	4-OCF ₃	192-194
15	173	i-C ₃ H ₇	H	H	4-Cl	2,4-Cl ₂	174-176
20	174	i-C ₃ H ₇	H	H	4-Cl	3,4-F ₂	231-233
25	175	i-C ₃ H ₇	H	H	4-Cl	2,3-Cl ₂	186-188
30	176	i-C ₃ H ₇	H	H	4-Cl	2-CH ₃ -3-Cl	203-205
35	177	i-C ₃ H ₇	H	H	4-Cl	2-CH ₃ -4-Cl	206-208
40	178	i-C ₃ H ₇	H	H	4-Cl	2-CH ₃ -5-Cl	207-208
45	179	i-C ₃ H ₇	H	H	4-Cl	2-CH ₃ -5-F	229-231
50	180	i-C ₃ H ₇	H	H	4-Cl	2-CH ₃ -4-OCHF ₂	223-224
	181	i-C ₃ H ₇	H	H	5-Cl	H	186-188
	182	i-C ₃ H ₇	H	H	5-Cl	4-F	209-211
	183	i-C ₃ H ₇	H	H	5-Cl	2-CH ₃	187-189
	184	i-C ₃ H ₇	H	H	5-Cl	3-CF ₃	198-200
	185	i-C ₃ H ₇	H	H	5-Cl	4-OCF ₃	180-182
	186	i-C ₃ H ₇	H	H	5-Cl	2,3-Cl ₂	167-169
	187	i-C ₃ H ₇	H	H	5-Cl	2,4-Cl ₂	165-167
	188	i-C ₃ H ₇	H	H	5-Cl	3,4-F ₂	207-209
	189	i-C ₃ H ₇	H	H	5-Cl	2-CH ₃ -3-Cl	204-206
	190	i-C ₃ H ₇	H	H	5-Cl	2-CH ₃ -4-Cl	202-204
	191	i-C ₃ H ₇	H	H	5-Cl	2-CH ₃ -5-Cl	209-210
	192	i-C ₃ H ₇	H	H	5-Cl	2-CH ₃ -5-F	192-194
	193	i-C ₃ H ₇	H	H	5-Cl	2-CH ₃ -4-OCHF ₂	188-189

Table 1 (Cont'd)

	No	R ¹	R ²	R ³	Xn	Ym	Physical Properties (melting point: °C)
10	194	i-C ₃ H ₇	H	H	5-Cl	2,3,4-F ₃	224-226
	195	i-C ₃ H ₇	H	H	6-Cl	4-C ₄ H ₉ -n	194-196
15	196	i-C ₃ H ₇	H	H	6-Cl	4-C ₄ H ₉ -t	235-237
	197	i-C ₃ H ₇	H	H	6-Cl	4-CF ₂ CF ₂ CF ₃	216-217
20	198	i-C ₃ H ₇	H	H	6-Cl	4-CF(CF ₃) ₂	209-211
	199	i-C ₃ H ₇	H	H	6-Cl	4-(CF ₂) ₃ CF ₃	196-198
25	200	i-C ₃ H ₇	H	H	6-Cl	4-OCHF ₂	223-225
	201	i-C ₃ H ₇	H	H	6-Cl	4-OCF ₂ CHFOC ₃ F ₇ -n	205-207
30	202	i-C ₃ H ₇	H	H	6-Cl	4-SCH ₂ CF ₃	189-190
	203	i-C ₃ H ₇	H	H	6-Cl	4-SCF ₂ CHF ₂	211-213
35	204	i-C ₃ H ₇	H	H	6-Cl	4-SCF(CF ₃) ₂	250-252
	205	i-C ₃ H ₇	H	H	6-Cl	4-S(CF ₂) ₃ CF ₃	210-212
40	206	i-C ₃ H ₇	H	H	6-Cl	3-SOCF ₃	212-215
	207	i-C ₃ H ₇	H	H	6-Cl	4-COCH ₃	230-232
45	208	i-C ₃ H ₇	H	H	6-Cl	2,3-Cl ₂	179-180
	209	i-C ₃ H ₇	H	H	6-Cl	2,4-Cl ₂	199-200
50	210	i-C ₃ H ₇	H	H	6-Cl	2,4-F ₂	196-198
	211	i-C ₃ H ₇	H	H	6-Cl	2-Cl-4-F	196-197
55	212	i-C ₃ H ₇	H	H	6-Cl	2-F-4-Cl	184-186
	213	i-C ₃ H ₇	H	H	6-Cl	2,3-(CH ₃) ₂	214-216
60	214	i-C ₃ H ₇	H	H	6-Cl	2-CH ₃ -4-Cl	233-235
	215	i-C ₃ H ₇	H	H	6-Cl	2-CH ₃ -5-Cl	204-206
65	216	i-C ₃ H ₇	H	H	6-Cl	2-CH ₃ -4-Br	242-244

Table 1 (Cont'd)

	No	R ¹	R ²	R ³	Xn	Ym	Physical Properties (melting point: °C)
5	217	i-C ₃ H ₇	H	H	6-Cl	2-CH ₃ -4-I	236-238
10	218	i-C ₃ H ₇	H	H	6-Cl	2-CH ₃ -4-OCH ₃	195-197
15	219	i-C ₃ H ₇	H	H	6-Cl	2,3-(CH ₃) ₂ -4-OCH ₃	242-244
20	220	i-C ₃ H ₇	H	H	6-Cl	2-Cl-4-CF ₃	171-172
25	221	i-C ₃ H ₇	H	H	6-Cl	2-CH ₃ -4-CF ₃	234-236
30	222	i-C ₃ H ₇	H	H	6-Cl	2-CH ₃ -4-OCF ₂ CCl ₃	169-171
35	223	i-C ₃ H ₇	H	H	6-Cl	2-CH ₃ -4-CF ₂ CF ₃	215-217
40	224	i-C ₃ H ₇	H	H	6-Cl	2-CH ₃ -4-CF(CF ₃) ₂	238-240
45	225	i-C ₃ H ₇	H	H	6-Cl	2-CH ₃ -4-(CF ₂) ₃ CF ₃	177-178
50	226	i-C ₃ H ₇	H	H	6-Cl	2-CH ₃ -4-(CF ₂) ₅ CF ₃	167-169
	227	i-C ₃ H ₇	H	H	6-Cl	3,5-Cl ₂ -4-OCHF ₂	196-198
	228	i-C ₃ H ₇	H	H	6-Cl	2-CH ₃ -4-OCF ₂ CCl ₂ F	218-220
	229	i-C ₃ H ₇	H	H	6-Cl	2-CH ₃ -4-OCF ₂ CBrF ₂	214-215
	230	i-C ₃ H ₇	H	H	6-Cl	2-CH ₃ -4-OCH ₂ CF ₂ CHF ₂	212-213
	231	i-C ₃ H ₇	H	H	6-Cl	2-Cl-4-CF(CF ₂) ₂	212-214
	232	i-C ₃ H ₇	H	H	6-Cl	3-Cl-4-OCHF ₂	204-206
	233	i-C ₃ H ₇	H	H	6-Cl	3-F-4-OCHF ₂	225-227
	234	i-C ₃ H ₇	H	H	6-Cl	2-Cl-4-OCF ₃	161-162
	235	i-C ₃ H ₇	H	H	6-Cl	2-Br-4-OCF ₃	188-189
	236	i-C ₃ H ₇	H	H	6-Cl	2-CH ₃ -4-OCHF ₂	213-215
	237	i-C ₃ H ₇	H	H	6-Cl	2-CH ₃ -4-OCF ₃	212-214
	238	i-C ₃ H ₇	H	H	6-Cl	2-CH ₃ -4-OCBrF ₂	195-196
	239	i-C ₃ H ₇	H	H	6-Cl	2-CH ₃ -4-OCF ₂ CHF ₂	199-201

Table 1 (Cont'd)

No	R ¹	R ²	R ³	Xn	Ym	Physical Properties (melting point: °C)
240	i-C ₃ H ₇	H	H	6-Cl	2-CH ₃ -3-OCF ₂ CHClF	195-197
241	i-C ₃ H ₇	H	H	6-Cl	2-CH ₃ -4-OCF ₂ CHClF	204-213
242	i-C ₃ H ₇	H	H	6-Cl	2-CH ₃ -4-OCF ₂ CHFC ₃	199-200
243	i-C ₃ H ₇	H	H	6-Cl	2-CH ₃ -4-OCF ₂ CBrFCF ₃	226-227
244	i-C ₃ H ₇	H	H	6-Cl	2-CH ₃ -4-OCF ₂ CHFOCF ₃	210-212
245	i-C ₃ H ₇	H	H	6-Cl	2-CH ₃ -4-OCHF ₂ -5-Cl	234-235
246	i-C ₃ H ₇	H	H	6-Cl	2-CH ₃ -4-OCF ₂ CHF ₂ -5-Cl	230-232
247	i-C ₃ H ₇	H	H	6-Cl	2-CH ₃ -4-SCHF ₂	199-201
248	i-C ₃ H ₇	H	H	6-Cl	2-CH ₃ -4-(F ₃ -PhO)	243-245
249	i-C ₃ H ₇	H	H	6-Cl	2-CH ₃ -4-(5-CF ₃ -2-Pyi-0)	116-120
250	i-C ₃ H ₇	H	H	6-Cl	2-CH ₃ -4-(3-Cl- 5-CF ₃ -2-Pyi-0)	219-221
251	i-C ₃ H ₇	H	H	6-Cl	2-CH ₃ -4-P=O(OC ₂ H ₅) ₂	146-147
252	i-C ₃ H ₇	H	H	6-Cl	2-CH ₃ -4-OP=S(OCH ₃) ₂	183-185
253	i-C ₃ H ₇	H	H	6-Cl	2-CF ₃ -4-OCHF ₂	234-236
254	i-C ₃ H ₇	H	H	6-Cl	3-CF ₃ -4-OCHF ₂	204-205
255	i-C ₃ H ₇	H	H	6-Cl	3-N=C(CF ₃)-O-4	270-272
256	i-C ₃ H ₇	H	H	6-Cl	3-N=C(CF ₃)-NH-4	213-215
257	i-C ₃ H ₇	H	H	6-Cl	3-N=C(CF ₃)-N(CH ₃)-4	239-241
258	i-C ₃ H ₇	H	H	3,6-Cl ₂	2-CH ₃ -4-OCHF ₂	221-222
259	i-C ₃ H ₇	H	H	3,6-Cl ₂	2-CH ₃ -4-Cl	234-235
260	i-C ₃ H ₇	H	H	3,4,5,6-Cl ₄	2-CH ₃ -4-Cl	265-266

Table 1 (Cont'd)

	No	R ¹	R ²	R ³	Xn	Ym	Physical Properties (melting point: °C)
5	261	i-C ₃ H ₇	H	H	3-Br	4-CF ₃	221-223
10	262	i-C ₃ H ₇	H	H	3-Br	4-OCF ₃	208-210
15	263	i-C ₃ H ₇	H	H	3-Br	2,3-(CH ₃) ₂	248-250
20	264	i-C ₃ H ₇	H	H	3-Br	2,4-(CH ₃) ₂	223-224
25	265	i-C ₃ H ₇	H	H	3-Br	2,4,6-(CH ₃) ₃	254-255
30	266	i-C ₃ H ₇	H	H	3-Br	2-CH ₃ -3-Cl	215-217
35	267	i-C ₃ H ₇	H	H	3-Br	2-CH ₃ -4-Cl	176-178
40	268	i-C ₃ H ₇	H	H	3-Br	2-CH ₃ -5-Cl	196-198
45	269	i-C ₃ H ₇	H	H	3-Br	2,3-(CH ₃) ₂ -4-Cl	222-224
50	270	i-C ₃ H ₇	H	H	3-Br	2,4-(CH ₃) ₂ -3-Cl	236-238
	271	i-C ₃ H ₇	H	H	3-Br	2-C ₂ H ₅ -4-Cl	205-207
	272	i-C ₃ H ₇	H	H	3-Br	2-CH ₃ -4-Br	220-222
	273	i-C ₃ H ₇	H	H	3-Br	2,3-(CH ₃) ₂ -4-Br	200-202
	274	i-C ₃ H ₇	H	H	3-Br	2-CH ₃ -4-I	203-205
	275	i-C ₃ H ₇	H	H	3-Br	2-CH ₃ -4-F	223-224
	276	i-C ₃ H ₇	H	H	3-Br	2-Cl-4-CF ₃	156-157
	277	i-C ₃ H ₇	H	H	3-Br	2-CH ₃ -4-CF ₃	227-228
	278	i-C ₃ H ₇	H	H	3-Br	2-CH ₃ -4-CF ₂ CF ₃	201-202
	279	i-C ₃ H ₇	H	H	3-Br	2-CH ₃ -4-CF ₂ CF ₂ CF ₃	199-200
	280	i-C ₃ H ₇	H	H	3-Br	2-CH ₃ -4-CF(CF ₃) ₂	222-224
	281	i-C ₃ H ₇	H	H	3-Br	2-CH ₃ -4-(CF ₂) ₃ CF ₃	190-191
	282	i-C ₃ H ₇	H	H	3-Br	2-CH ₃ -4-OCH ₃	199-200

Table 1 (Cont'd)

	No	R ¹	R ²	R ³	Xn	Yn	Physical Properties (melting point: °C)
10	283	i-C ₃ H ₇	H	H	3-Br	2-CH ₃ -4-OCH ₂ CF ₂ CHF ₂	206-207
	284	i-C ₃ H ₇	H	H	3-Br	2,4-(CH ₃) ₂ -3-OCHF ₂	187-189
15	285	i-C ₃ H ₇	H	H	3-Br	2,3-(CH ₃) ₂ -4-OCH ₃	206-208
	286	i-C ₃ H ₇	H	H	3-Br	2-Cl-4-OCF ₃	165-167
20	287	i-C ₃ H ₇	H	H	3-Br	2-Br-4-OCF ₃	179-180
	288	i-C ₃ H ₇	H	H	3-Br	2-CH ₃ -4-OCHF ₂	205-207
25	289	i-C ₃ H ₇	H	H	3-Br	2-CH ₃ -4-OCF ₃	211-213
	290	i-C ₃ H ₇	H	H	3-Br	2-CH ₃ -4-OCBrF ₂	178-180
30	291	i-C ₃ H ₇	H	H	3-Br	2-CH ₃ -4-OCF ₂ CHFCF ₃	196-197
	292	i-C ₃ H ₇	H	H	3-Br	2-CH ₃ -4-OCF ₂ CHClF	194-195
35	293	i-C ₃ H ₇	H	H	3-Br	2-CH ₃ -4-OCF ₂ CHF ₂	205-207
	294	i-C ₃ H ₇	H	H	3-Br	2-CH ₃ -3-Cl-4-OCHF ₂	229-230
40	295	i-C ₃ H ₇	H	H	3-Br	2,3-(CH ₃) ₂ -4-OCHF ₂	219-220
	296	i-C ₃ H ₇	H	H	3-Br	2-CH ₃ -4-SCH ₃	215-217
45	297	i-C ₃ H ₇	H	H	3-Br	2-CH ₃ -4-(3-CF ₃ -PhO)	156-158
	298	i-C ₃ H ₇	H	H	3-Br	2-CH ₃ -4-(3-Cl- 5-CF ₃ -2-Pyi-0)	206-208
50	299	i-C ₃ H ₇	H	H	3-Br	2-CH ₃ -4-(5-CF ₃ - 2-Pyi-0)	182-184
	300	i-C ₃ H ₇	H	H	3-Br	-3-OCH ₂ O-4-	195-198
	301	i-C ₃ H ₇	H	H	6-Br	4-CF ₃	190-192
	302	i-C ₃ H ₇	H	H	6-Br	4-OCF ₃	210-212
	303	i-C ₃ H ₇	H	H	6-Br	2,3-(CH ₃) ₂	250-252

Table 1 (Cont'd)

	No	R ¹	R ²	R ³	Xn	Ym	Physical Properties (melting point: °C)
10	304	i-C ₃ H ₇	H	H	6-Br	2,4,6-(CH ₃) ₃	272-274
	305	i-C ₃ H ₇	H	H	6-Br	2-CH ₃ -3-Cl	214-216
15	306	i-C ₃ H ₇	H	H	6-Br	2-CH ₃ -4-Cl	198-200
	307	i-C ₃ H ₇	H	H	6-Br	2-CH ₃ -5-Cl	194-196
20	308	i-C ₃ H ₇	H	H	6-Br	2,3-(CH ₃) ₂ -4-Cl	227-229
	309	i-C ₃ H ₇	H	H	6-Br	2,4-(CH ₃) ₂ -3-Cl	249-251
25	310	i-C ₃ H ₇	H	H	6-Br	2-C ₂ H ₅ -4-Cl	243-245
	311	i-C ₃ H ₇	H	H	6-Br	2-CH ₃ -4-Br	227-228
30	312	i-C ₃ H ₇	H	H	6-Br	2,3-(CH ₃) ₂ -4-Br	209-211
	313	i-C ₃ H ₇	H	H	6-Br	2-CH ₃ -4-I	227-229
35	314	i-C ₃ H ₇	H	H	6-Br	2-CH ₃ -4-F	231-232
	315	i-C ₃ H ₇	H	H	6-Br	2-Cl-4-CF ₃	169-170
40	316	i-C ₃ H ₇	H	H	6-Br	2-CH ₃ -4-CF ₃	232-234
	317	i-C ₃ H ₇	H	H	6-Br	2-CH ₃ -4-CF(CF ₃) ₂	236-238
45	318	i-C ₃ H ₇	H	H	6-Br	2-CH ₃ -4-(CF ₂) ₃ CF ₃	208-210
	319	i-C ₃ H ₇	H	H	6-Br	2-CH ₃ -4-OCH ₂ CF ₂ CHF ₂	209-211
50	320	i-C ₃ H ₇	H	H	6-Br	2,4-(CH ₃) ₂ -3-OCHF ₂	247-249
	321	i-C ₃ H ₇	H	H	6-Br	2,3-(CH ₃) ₂ -4-OCH ₃	250-252
55	322	i-C ₃ H ₇	H	H	6-Br	2-CH ₃ -4-OCH ₃	220-222
	323	i-C ₃ H ₇	H	H	6-Br	2-Cl-4-OCF ₃	182-183
60	324	i-C ₃ H ₇	H	H	6-Br	2-Br-4-OCF ₃	195-196
	325	i-C ₃ H ₇	H	H	6-Br	2-CH ₃ -4-OCHF ₂	225-226
65	326	i-C ₃ H ₇	H	H	6-Br	2-CH ₃ -4-OCF ₃	223-225

Table 1 (Cont'd)

No	R ¹	R ²	R ³	Xn	Ym	Physical Properties (melting point: °C)
327	i-C ₃ H ₇	H	H	6-Br	2-CH ₃ -4-OCBrF ₂	194-196
328	i-C ₃ H ₇	H	H	6-Br	2-CH ₃ -4-OCF ₂ CHFCF ₃	212-213
329	i-C ₃ H ₇	H	H	6-Br	2-CH ₃ -4-OCF ₂ CHClF	211-213
330	i-C ₃ H ₇	H	H	6-Br	2-CH ₃ -4-OCF ₂ CHF ₂	214-215
331	i-C ₃ H ₇	H	H	6-Br	2,3-(CH ₃) ₂ -4-OCHF ₂	228-229
332	i-C ₃ H ₇	H	H	6-Br	2-CH ₃ -3-Cl-4-OCHF ₂	224-225
333	i-C ₃ H ₇	H	H	6-Br	2-CH ₃ -4-SCH ₃	215-217
334	i-C ₃ H ₇	H	H	6-Br	2-CH ₃ -4-(3-CF ₃ -PhO)	194-195
335	i-C ₃ H ₇	H	H	6-Br	2-CH ₃ -4-(5-CF ₃ - -2-Pyi-0)	201-203
336	i-C ₃ H ₇	H	H	6-Br	2-CH ₃ -4-(3-Cl-5- CF ₃ -2-Pyi-0)	234-236
337	i-C ₃ H ₇	H	H	6-Br	-3-OCH ₂ O-4-	205-207
338	i-C ₃ H ₇	H	H	3,4-Br ₂	2-CH ₃ -4-OCHF ₂	196-197
339	i-C ₃ H ₇	H	H	3,4-Br ₂	2-CH ₃ -4-Cl	199-201
340	i-C ₃ H ₇	H	H	3,6-Br	2-CH ₃ -4-OCHF ₂	233-234
341	i-C ₃ H ₇	H	H	3,6-Br ₂	2-CH ₃ -4-Cl	245-247
342	i-C ₃ H ₇	H	H	5,6-Br ₂	2-CH ₃ -4-OCHF ₂	208-210
343	i-C ₃ H ₇	H	H	5,6-Br ₂	2-CH ₃ -4-Cl	259-261
344	i-C ₃ H ₇	H	H	3,4,5,6-Br ₄	2-CH ₃ -4-Cl	270-272
345	i-C ₃ H ₇	H	H	3-I	4-Cl	230-232
346	i-C ₃ H ₇	H	H	3-I	4-Br	251-253
347	i-C ₃ H ₇	H	H	3-I	4-I	231-233

Table 1 (Cont'd)

	No	R ¹	R ²	R ³	Xn	Ym	Physical Properties (melting point: °C)
10	348	i-C ₃ H ₇	H	H	3-I	3-CF ₃	194-197
	349	i-C ₃ H ₇	H	H	3-I	4-CF ₃	223-224
15	350	i-C ₃ H ₇	H	H	3-I	4-CF ₂ CF ₂ CF ₃	217-219
	351	i-C ₃ H ₇	H	H	3-I	4-CF(CF ₃) ₂	209-211
20	352	i-C ₃ H ₇	H	H	3-I	4-OCF ₃	222-223
	353	i-C ₃ H ₇	H	H	3-I	4-OCF ₂ CHFOCF ₃	192-194
25	354	i-C ₃ H ₇	H	H	3-I	4-SCHF ₂	204-206
	355	i-C ₃ H ₇	H	H	3-I	4-SCH ₂ CF ₃	195-197
30	356	i-C ₃ H ₇	H	H	3-I	4-SCF ₂ CHF ₂	196-198
	357	i-C ₃ H ₇	H	H	3-I	4-SCF ₂ CBrF ₂	203-205
35	358	i-C ₃ H ₇	H	H	3-I	4-SCF(CF ₃) ₂	170-172
	359	i-C ₃ H ₇	H	H	3-I	4-S(CF ₂) ₃ CF ₃	185-187
40	360	i-C ₃ H ₇	H	H	3-I	3,4-F ₂	227-229
	361	i-C ₃ H ₇	H	H	3-I	2-CH ₃ -3-Cl	222-224
45	362	i-C ₃ H ₇	H	H	3-I	2-CH ₃ -4-Cl	215-217
	363	i-C ₃ H ₇	H	H	3-I	2-CH ₃ -5-Cl	210-212
50	364	i-C ₃ H ₇	H	H	3-I	2,4-(CH ₃) ₂ -3-Cl	226-228
	365	i-C ₃ H ₇	H	H	3-I	2,3-(CH ₃) ₂ -4-Cl	235-237
55	366	i-C ₃ H ₇	H	H	3-I	2-CH ₃ -4-Br	227-229
	367	i-C ₃ H ₇	H	H	3-I	2-CH ₃ -4-I	201-203
60	368	i-C ₃ H ₇	H	H	3-I	2-CH ₃ -4-F	227-228
	369	i-C ₃ H ₇	H	H	3-I	2-Cl-4-CF ₃	170-171
65	370	i-C ₃ H ₇	H	H	3-I	2-CH ₃ -3-CF ₃	179-181

Table 1 (Cont'd)

	No	R ¹	R ²	R ³	Xn	Yn	Physical Properties (melting point: °C)
5	371	i-C ₃ H ₇	H	H	3-I	2-CH ₃ -4-CF ₃	202-203
10	372	i-C ₃ H ₇	H	H	3-I	2-CH ₃ -4-CF ₂ CF ₃	195-196
15	373	i-C ₃ H ₇	H	H	3-I	2-CH ₃ -4-CF ₂ CF ₂ CF ₃	193-195
20	374	i-C ₃ H ₇	H	H	3-I	2-CH ₃ -4-CF(CF ₃) ₂	211-213
25	375	i-C ₃ H ₇	H	H	3-I	2-CH ₃ -4-(CF ₂) ₃ CF ₃	203-204
30	376	i-C ₃ H ₇	H	H	3-I	2-CH ₃ -4-OCH ₃	204-206
35	377	i-C ₃ H ₇	H	H	3-I	2-CH ₃ -4-O-C ₃ H ₇ -i	209-211
40	378	i-C ₃ H ₇	H	H	3-I	2,3-(CH ₃) ₂ -4-OCH ₃	220-222
45	379	i-C ₃ H ₇	H	H	3-I	2-CH ₃ -4-OCH ₂ CF ₃	223-224
50	380	i-C ₃ H ₇	H	H	3-I	2-CH ₃ -4-OCF ₂ CBrF ₂	228-230
	381	i-C ₃ H ₇	H	H	3-I	2-CH ₃ -4-OCF ₂ CCl ₂ F	230-231
	382	i-C ₃ H ₇	H	H	3-I	3-F-4-OCHF ₂	208-210
	383	i-C ₃ H ₇	H	H	3-I	3,5-Cl ₂ -4-OCHF ₂	234-236
	384	i-C ₃ H ₇	H	H	3-I	3-OCH ₃ -4-OCHF ₂	196-198
	385	i-C ₃ H ₇	H	H	3-I	3,4-(OCHF ₂) ₂	171-172
	386	i-C ₃ H ₇	H	H	3-I	2-CH ₃ -4-OCF ₃	214-216
	387	i-C ₃ H ₇	H	H	3-I	2-CH ₃ -4-OCHF ₂	207-209
	388	i-C ₃ H ₇	H	H	3-I	2-CH ₃ -4-OCH ₂ CF ₂ CHF ₂	229-231
	389	i-C ₃ H ₇	H	H	3-I	2-CH ₃ -4-OCBrF ₂	181-182
	390	i-C ₃ H ₇	H	H	3-I	2-CH ₃ -4-OCF ₂ CHF ₂	197-199
	391	i-C ₃ H ₇	H	H	3-I	2-CH ₃ -4-OCF ₂ CHF ₂ -5-Cl	198-200
	392	i-C ₃ H ₇	H	H	3-I	2-CH ₃ -4-OCF ₂ CHClF	200-201
	393	i-C ₃ H ₇	H	H	3-I	2-CH ₃ -4-OCF ₂ CHFCF ₃	213-214

Table 1 (Cont'd)

	No	R ¹	R ²	R ³	Xn	Y _n	Physical Properties (melting point: °C)
10	394	i-C ₃ H ₇	H	H	3-I	2-CH ₃ -4-OCF ₂ CBrFCF ₃	233-234
15	395	i-C ₃ H ₇	H	H	3-I	2-CH ₃ -4-OCF ₂ CHFOCF ₃	213-215
20	396	i-C ₃ H ₇	H	H	3-I	2-CH ₃ -4-OCHF ₂ -5-Cl	230-232
25	397	i-C ₃ H ₇	H	H	3-I	2-CH ₃ -4-(F ₅ -PhO)	245-247
30	398	i-C ₃ H ₇	H	H	3-I	2-CH ₃ -4-(3-CF ₃ -PhO)	168-170
35	399	i-C ₃ H ₇	H	H	3-I	2-CH ₃ -4-(5-CF ₃ -2-Pyi-O)	186-188
40	400	i-C ₃ H ₇	H	H	3-I	2-CH ₃ -4-(3-Cl-5-CF ₃ -2-Pyi-O)	212-214
45	401	i-C ₃ H ₇	H	H	3-I	2-CH ₃ -4-SO ₂ CH ₃	172-175
50	402	i-C ₃ H ₇	H	H	3-I	2-CH ₃ -4-SC ₃ H ₇ -i	190-192
	403	i-C ₃ H ₇	H	H	3-I	2-CH ₃ -4-SCF ₂ CF ₂ CF ₃	227-228
	404	i-C ₃ H ₇	H	H	3-I	2-CH ₃ -4-(4-Cl-PhS)	191-192
	405	i-C ₃ H ₇	H	H	3-I	4-(3-Cl-5-CF ₃ -2-Pyi-S)	198-200
	406	i-C ₃ H ₇	H	H	3-I	2-Br-4-OCF ₃	196-198
	407	i-C ₃ H ₇	H	H	3-I	2-Cl-4-CF ₂ CF ₂ CF ₃	162-164
	408	i-C ₃ H ₇	H	H	3-I	2-Cl-4-OCF ₃	173-175
	409	i-C ₃ H ₇	H	H	3-I	2-CF ₃ -4-OCHF ₂	219-220
	410	i-C ₃ H ₇	H	H	3-I	3-CF ₃ -4-OCHF ₂	128-130
	411	i-C ₃ H ₇	H	H	6-I	4-Cl	251-253
	412	i-C ₃ H ₇	H	H	6-I	4-Br	270-272
	413	i-C ₃ H ₇	H	H	6-I	4-I	242-244
	414	i-C ₃ H ₇	H	H	6-I	3-CF ₃	210-212

Table 1 (Cont'd)

	No	R ¹	R ²	R ³	Xn	Ym	Physical Properties (melting point: °C)
5	415	i-C ₃ H ₇	H	H	6-I	4-CF ₃	201-202
10	416	i-C ₃ H ₇	H	H	6-I	4-CF(CF ₃) ₂	238-240
15	417	i-C ₃ H ₇	H	H	6-I	4-CF ₂ CF ₂ CF ₃	238-240
20	418	i-C ₃ H ₇	H	H	6-I	4-OCF ₃	193-194
25	419	i-C ₃ H ₇	H	H	6-I	4-OCF ₂ CHFOC ₃ F _{7-n}	213-214
30	420	i-C ₃ H ₇	H	H	6-I	4-SCH ₂ CF ₃	217-219
35	421	i-C ₃ H ₇	H	H	6-I	4-SCHF ₂	224-226
40	422	i-C ₃ H ₇	H	H	6-I	4-SCF ₂ CHF ₂	213-215
45	423	i-C ₃ H ₇	H	H	6-I	4-SCF ₂ CBrF ₂	220-222
50	424	i-C ₃ H ₇	H	H	6-I	4-SCF ₂ CF ₂ CF ₃	196-197
	425	i-C ₃ H ₇	H	H	6-I	4-SCF(CF ₃) ₂	216-218
	426	i-C ₃ H ₇	H	H	6-I	4-S(CF ₂) ₃ CF ₃	201-203
	427	i-C ₃ H ₇	H	H	6-I	2-CH ₃ -3-Cl	252-254
	428	i-C ₃ H ₇	H	H	6-I	2-CH ₃ -4-Cl	244-246
	429	i-C ₃ H ₇	H	H	6-I	2,4-(CH ₃) ₂ -3-Cl	260-262
	430	i-C ₃ H ₇	H	H	6-I	2-CH ₃ -4-Br	241-243
	431	i-C ₃ H ₇	H	H	6-I	2-CH ₃ -4-I	213-215
	432	i-C ₃ H ₇	H	H	6-I	2-CH ₃ -4-F	251-252
	433	i-C ₃ H ₇	H	H	6-I	2-Cl-4-CF ₃	195-196
	434	i-C ₃ H ₇	H	H	6-I	2,3-(CH ₃) ₂ -4-Cl	253-255
	435	i-C ₃ H ₇	H	H	6-I	2-CH ₃ -3-CF ₃	245-251
	436	i-C ₃ H ₇	H	H	6-I	2-CH ₃ -4-CF ₃	220-221
	437	i-C ₃ H ₇	H	H	6-I	2-CH ₃ -4-CF ₂ CF ₃	203-205

Table 1 (Cont'd)

	No	R ¹	R ²	R ³	Xn	Y _n	Physical Properties (melting point: °C)
10	438	i-C ₃ H ₇	H	H	6-I	2-CH ₃ -4-CF ₂ CF ₂ CF ₃	154-156
	439	i-C ₃ H ₇	H	H	6-I	2-CH ₃ -4-CF(CF ₃) ₂	237-239
15	440	i-C ₃ H ₇	H	H	6-I	2-CH ₃ -4-(CF ₂) ₃ CF ₃	168-170
	441	i-C ₃ H ₇	H	H	6-I	2-CH ₃ -4-OCH ₃	215-217
20	442	i-C ₃ H ₇	H	H	6-I	2-CH ₃ -4-O-C ₃ H ₇ -i	212-214
	443	i-C ₃ H ₇	H	H	6-I	2-CH ₃ -4-OCH ₂ CF ₃	233-234
25	444	i-C ₃ H ₇	H	H	6-I	2-CH ₃ -4-OCF ₂ CBrF ₂	242-244
	445	i-C ₃ H ₇	H	H	6-I	2-CH ₃ -4-OCF ₂ CCl ₂ F	251-253
30	446	i-C ₃ H ₇	H	H	6-I	2-CH ₃ -4-OCF ₂ CBrFCF ₃	251-253
	447	i-C ₃ H ₇	H	H	6-I	2-CH ₃ -4-OCH ₂ CF ₂ CHF ₂	235-237
35	448	i-C ₃ H ₇	H	H	6-I	3-F-4-OCHF ₂	214-216
	449	i-C ₃ H ₇	H	H	6-I	3,5-Cl ₂ -4-OCHF ₂	211-213
40	450	i-C ₃ H ₇	H	H	6-I	3-OCH ₃ -4-OCHF ₂	215-217
	451	i-C ₃ H ₇	H	H	6-I	2,3-(CH ₃) ₂ -4-OCH ₃	253-254
45	452	i-C ₃ H ₇	H	H	6-I	2-CH ₃ -4-OCBrF ₂	192-194
	453	i-C ₃ H ₇	H	H	6-I	2-CH ₃ -4-OCF ₂ CHF ₂	216-218
50	454	i-C ₃ H ₇	H	H	6-I	2-CH ₃ -4-OCF ₂ CHF ₂ -5-Cl	230-232
	455	i-C ₃ H ₇	H	H	6-I	2-CH ₃ -4-OCF ₂ CHClF	205-207
55	456	i-C ₃ H ₇	H	H	6-I	2-CH ₃ -4-OCF ₂ CHFCF ₃	222-223
	457	i-C ₃ H ₇	H	H	6-I	2-CH ₃ -4-OCF ₂ CHFOCF ₃	258-260
60	458	i-C ₃ H ₇	H	H	6-I	2-CH ₃ -4-(3-CF ₃ -PhO)	198-199
	459	i-C ₃ H ₇	H	H	6-I	2-CH ₃ -4-(F ₅ -PhO)	262-264
65	460	i-C ₃ H ₇	H	H	6-I	2-CH ₃ -4-(5-CF ₃ -2-Py-0)	245-246

Table 1 (Cont'd)

	No	R ¹	R ²	R ³	Xn	Y _n	Physical Properties (melting point: °C)
5	461	i-C ₃ H ₇	H	H	6-I	2-CH ₃ -4-(3-Cl-5-CF ₃ -2-Pyi-O)	231-232
10	462	i-C ₃ H ₇	H	H	6-I	2-CH ₃ -4-SC ₃ H ₇ -i	197-199
15	463	i-C ₃ H ₇	H	H	6-I	2-CH ₃ -4-(4-Cl-PhS)	211-213
20	464	i-C ₃ H ₇	H	H	6-I	2-CH ₃ -4-OCF ₃	230-232
25	465	i-C ₃ H ₇	H	H	6-I	2-CF ₃ -4-OCHF ₂	238-239
30	466	i-C ₃ H ₇	H	H	6-I	2-Br-4-OCF ₃	215-217
35	467	i-C ₃ H ₇	H	H	6-I	2-Cl-4-OCF ₃	186-188
40	468	i-C ₃ H ₇	H	H	6-I	2-Cl-4-CF ₂ CF ₂ CF ₃	199-200
45	469	i-C ₃ H ₇	H	H	6-I	2-CH ₃ -4-OCHF ₂	226-228
50	470	i-C ₃ H ₇	H	H	6-I	2-CH ₃ -4-OCHF ₂ -5-Cl	239-240
	471	i-C ₃ H ₇	H	H	6-I	3-CF ₃ -4-OCHF ₂	238-239
	472	i-C ₃ H ₇	H	H	3-F	4-(CF ₂) ₃ CF ₃	187-188
	473	i-C ₃ H ₇	H	H	3-F	4-CF ₂ CF ₂ CF ₃	182-183
	474	i-C ₃ H ₇	H	H	3-F	4-CF(CF ₃) ₂	206-208
	475	i-C ₃ H ₇	H	H	3-F	4-OCF ₃	197-199
	476	i-C ₃ H ₇	H	H	3-F	4-OCF ₂ CHFOC ₃ F _{7-n}	142-144
	477	i-C ₃ H ₇	H	H	3-F	4-SCHF ₂	190-192
	478	i-C ₃ H ₇	H	H	3-F	4-SCH ₂ CF ₃	157-158
	479	i-C ₃ H ₇	H	H	3-F	4-SCF ₂ CHF ₂	177-178
	480	i-C ₃ H ₇	H	H	3-F	4-SCF ₂ CBrF ₂	197-199
	481	i-C ₃ H ₇	H	H	3-F	4-SCF(CF ₃) ₂	206-208
	482	i-C ₃ H ₇	H	H	3-F	4-S(CF ₂) ₃ CF ₃	173-174

Table 1 (Cont'd)

	No	R ¹	R ²	R ³	Xn	Yn	Physical Properties (melting point: °C)
10	483	i-C ₃ H ₇	H	H	3-F	4-SOCH ₂ CF ₃	115-119
	484	i-C ₃ H ₇	H	H	3-F	4-SOCF ₂ CBrF ₂	181-182
15	485	i-C ₃ H ₇	H	H	3-F	4-SOCF(CF ₃) ₂	195-197
	486	i-C ₃ H ₇	H	H	3-F	4-SO(CF ₂) ₃ CF ₃	175-176
20	487	i-C ₃ H ₇	H	H	3-F	4-SO ₂ CH ₂ CF ₃	199-202
	488	i-C ₃ H ₇	H	H	3-F	2,3-Cl ₂	175-177
25	489	i-C ₃ H ₇	H	H	3-F	2-CH ₃ -3-Cl	193-194
	490	i-C ₃ H ₇	H	H	3-F	2-CH ₃ -4-Cl	192-194
30	491	i-C ₃ H ₇	H	H	3-F	2-CH ₃ -5-Cl	191-193
	492	i-C ₃ H ₇	H	H	3-F	2-CH ₃ -4-I	192-194
35	493	i-C ₃ H ₇	H	H	3-F	2-CH ₃ -5-F	175-177
	494	i-C ₃ H ₇	H	H	3-F	2-CH ₃ -3-F	187-189
40	495	i-C ₃ H ₇	H	H	3-F	2-CH ₃ -4-CF ₂ CF ₃	213-214
	496	i-C ₃ H ₇	H	H	3-F	2-CH ₃ -4-CF ₂ CF ₂ CF ₃	191-192
45	497	i-C ₃ H ₇	H	H	3-F	2-CH ₃ -4-CF(CF ₃) ₂	241-243
	498	i-C ₃ H ₇	H	H	3-F	2-CH ₃ -4-(CF ₂) ₃ CF ₃	138-139
50	499	i-C ₃ H ₇	H	H	3-F	2-CH ₃ -3-OCHF ₂	172-174
	500	i-C ₃ H ₇	H	H	3-F	2-CH ₃ -4-OCHF ₂	160-162
55	501	i-C ₃ H ₇	H	H	3-F	2-CH ₃ -4-OCF ₂ CCl ₃	162-163
	502	i-C ₃ H ₇	H	H	3-F	2-CH ₃ -4-OCF ₂ CCl ₂ F	207-208
60	503	i-C ₃ H ₇	H	H	3-F	2-CH ₃ -4-OCF ₂ CBrF ₂	196-197
	504	i-C ₃ H ₇	H	H	3-F	2-Cl-4-CF ₃	169-170
65	505	i-C ₃ H ₇	H	H	3-F	2-Cl-4-CF ₂ CF ₂ CF ₃	169-170

Table 1 (Cont'd)

No	R ¹	R ²	R ³	Xn	Ym	Physical Properties (melting point: °C)
506	i-C ₃ H ₇	H	H	3-F	3,5-Cl ₂ -4-OCHF ₂	201-202
507	i-C ₃ H ₇	H	H	3-F	2-Cl-4-CF(CF ₃) ₂	223-225
508	i-C ₃ H ₇	H	H	3-F	2-Cl-4-OCF ₃	169-170
509	i-C ₃ H ₇	H	H	3-F	2-Br-4-OCF ₃	164-165
510	i-C ₃ H ₇	H	H	3-F	2-CH ₃ -4-OCF ₃	183-184
511	i-C ₃ H ₇	H	H	3-F	2-CH ₃ -4-OCBrF ₂	177-178
512	i-C ₃ H ₇	H	H	3-F	2-CH ₃ -4-OCF ₂ CHF ₂	172-173
513	i-C ₃ H ₇	H	H	3-F	2-CH ₃ -4-OCF ₂ CHClF	168-169
514	i-C ₃ H ₇	H	H	3-F	2-CH ₃ -4-OCF ₂ CHFCF ₃	160-162
515	i-C ₃ H ₇	H	H	3-F	2-CH ₃ -4-OCF ₂ CHFOCF ₃	148-150
516	i-C ₃ H ₇	H	H	3-F	2-CH ₃ -4-OCF ₂ CBrFCF ₃	148-150
517	i-C ₃ H ₇	H	H	3-F	2-CH ₃ -4-OCHF ₂ -5-Cl	187-188
518	i-C ₃ H ₇	H	H	3-F	2-CH ₃ -4-SC ₃ H ₇ -i	165-167
519	i-C ₃ H ₇	H	H	3-F	2-CH ₃ -4-(3-CF ₃ -PhO)	135-136
520	i-C ₃ H ₇	H	H	3-F	2-CH ₃ -4-(F ₅ -PhO)	206-207
521	i-C ₃ H ₇	H	H	3-F	2-CH ₃ -4-(2-Cl-4-CF ₃ -PhO)	215-217
522	i-C ₃ H ₇	H	H	3-F	2-CH ₃ -4-(4-Cl-PhS)	176-178
523	i-C ₃ H ₇	H	H	3-F	2-CH ₃ -4-(5-CF ₃ -2-Pyi-O)	175-176
524	i-C ₃ H ₇	H	H	3-F	2-CH ₃ -4-(3-Cl-5-CF ₃ -2-Pyi-O)	188-190
525	i-C ₃ H ₇	H	H	3-F	4-(3-Cl-5-CF ₃ -2-Pyi-S)	213-215
526	i-C ₃ H ₇	H	H	3-F	2-CH ₃ -4-OP=S(OCH ₃) ₂	175-177

Table 1 (Cont'd)

	No	R ¹	R ²	R ³	Xn	Yn	Physical Properties (melting point: °C)
10	527	i-C ₃ H ₇	H	H	3-F	2-CF ₃ -4-OCHF ₂	180-182
	528	i-C ₃ H ₇	H	H	3-F	-3-OCH ₂ O-4-	197-199
15	529	i-C ₃ H ₇	H	H	4-F	2-CH ₃ -4-Cl	217-218
	530	i-C ₃ H ₇	H	H	4-F	2-CH ₃ -5-Cl	202-203
20	531	i-C ₃ H ₇	H	H	4-F	2-CH ₃ -4-OCHF ₂	191-193
	532	i-C ₃ H ₇	H	H	5-F	2-CH ₃ -4-Cl	197-198
25	533	i-C ₃ H ₇	H	H	5-F	2-CH ₃ -4-CF ₂ CF ₂ CF ₃	213-215
	534	i-C ₃ H ₇	H	H	5-F	2-CH ₃ -4-OCHF ₂	181-182
30	535	i-C ₃ H ₇	H	H	6-F	4-CF ₂ CF ₂ CF ₃	201-202
	536	i-C ₃ H ₇	H	H	6-F	4-(CF ₂) ₃ CF ₃	156-158
35	537	i-C ₃ H ₇	H	H	6-F	4-OCF ₃	212-214
	538	i-C ₃ H ₇	H	H	6-F	4-OCF ₂ CHFOC ₃ F _{7-n}	178-180
40	539	i-C ₃ H ₇	H	H	6-F	4-SCH ₂ CF ₃	176-178
	540	i-C ₃ H ₇	H	H	6-F	4-SCF ₂ CHF ₂	230-232
45	541	i-C ₃ H ₇	H	H	6-F	4-SCF(CF ₃) ₂	218-220
	542	i-C ₃ H ₇	H	H	6-F	4-S(CF ₂) ₃ CF ₃	178-181
50	543	i-C ₃ H ₇	H	H	6-F	2,3-Cl ₂	158-160
	544	i-C ₃ H ₇	H	H	6-F	2-CH ₃ -3-Cl	182-184
55	545	i-C ₃ H ₇	H	H	6-F	2-CH ₃ -4-Cl	204-206
	546	i-C ₃ H ₇	H	H	6-F	2-CH ₃ -5-Cl	196-199
60	547	i-C ₃ H ₇	H	H	6-F	2-CH ₃ -4-I	213-215
	548	i-C ₃ H ₇	H	H	6-F	2-CH ₃ -3-F	165-167
65	549	i-C ₃ H ₇	H	H	6-F	2-CH ₃ -5-F	181-183

Table 1 (Cont'd)

	No	R ¹	R ²	R ³	Xn	Ym	Physical Properties (melting point: °C)
5	550	i-C ₃ H ₇	H	H	6-F	2-Cl-4-CF ₃	190-191
10	551	i-C ₃ H ₇	H	H	6-F	2-CH ₃ -4-CF ₂ CF ₃	222-223
15	552	i-C ₃ H ₇	H	H	6-F	2-CH ₃ -4-OCF ₂ CCl ₃	184-185
20	553	i-C ₃ H ₇	H	H	6-F	2-CH ₃ -4-OCF ₂ CCl ₂ F	214-215
25	554	i-C ₃ H ₇	H	H	6-F	2-CH ₃ -4-OCF ₂ CBrF ₂	208-210
30	555	i-C ₃ H ₇	H	H	6-F	2-CH ₃ -4-CF ₂ CF ₂ CF ₃	168-170
35	556	i-C ₃ H ₇	H	H	6-F	2-CH ₃ -4-CF(CF ₃) ₂	255-257
40	557	i-C ₃ H ₇	H	H	6-F	2-CH ₃ -4-(CF ₂) ₃ CF ₃	157-159
45	558	i-C ₃ H ₇	H	H	6-F	2-CH ₃ -3-OCHF ₂	177-179
50	559	i-C ₃ H ₇	H	H	6-F	2-CH ₃ -4-OCHF ₂	176-178
	560	i-C ₃ H ₇	H	H	6-F	3,5-Cl ₂ -4-OCHF ₂	198-200
	561	i-C ₃ H ₇	H	H	6-F	2-Cl-4-CF(CF ₃) ₂	241-243
	562	i-C ₃ H ₇	H	H	6-F	2-Cl-4-OCF ₃	171-172
	563	i-C ₃ H ₇	H	H	6-F	2-Br-4-OCF ₃	181-182
	564	i-C ₃ H ₇	H	H	6-F	2-CH ₃ -4-OCF ₃	193-195
	565	i-C ₃ H ₇	H	H	6-F	2-CH ₃ -4-OCBrF ₂	181-183
	566	i-C ₃ H ₇	H	H	6-F	2-CH ₃ -4-OCF ₂ CHF ₂	185-187
	567	i-C ₃ H ₇	H	H	6-F	2-CH ₃ -4-OCF ₂ CHClF	175-176
	568	i-C ₃ H ₇	H	H	6-F	2-CH ₃ -4-OCF ₂ CHFCF ₃	176-178
	569	i-C ₃ H ₇	H	H	6-F	2-CH ₃ -4-OCF ₂ CBrFCF ₃	217-219
	570	i-C ₃ H ₇	H	H	6-F	2-CH ₃ -4-OCF ₂ CHFOCF ₃	183-185
	571	i-C ₃ H ₇	H	H	6-F	2-CH ₃ -4-OCHF ₂ -5-Cl	209-211
	572	i-C ₃ H ₇	H	H	6-F	2-CH ₃ -4-(3-CF ₃ -PhO)	184-185

Table 1 (Cont'd)

No	R ¹	R ²	R ³	Xn	Ym	Physical Properties (melting point: °C)
573	i-C ₃ H ₇	H	H	6-F	2-CH ₃ -4-(F ₅ -PhO)	227-228
574	i-C ₃ H ₇	H	H	6-F	2-CH ₃ -4-(2-Cl-4-CF ₃ -PhO)	220-222
575	i-C ₃ H ₇	H	H	6-F	2-CH ₃ -4-(4-Cl-PhS)	190-193
576	i-C ₃ H ₇	H	H	6-F	2-CH ₃ -4-(5-CF ₃ -2-Pyi-O)	206-207
577	i-C ₃ H ₇	H	H	6-F	2-CH ₃ -4-(3-Cl- 5-CF ₃ -2-Pyi-O)	177-179
578	i-C ₃ H ₇	H	H	6-F	2-CH ₃ -4-OP=S(OCH ₃) ₂	188-190
579	i-C ₃ H ₇	H	H	6-F	2-CF ₃ -4-OCHF ₂	223-225
580	i-C ₃ H ₇	H	H	6-F	-3-OCH ₂ O-4-	201-203
581	i-C ₃ H ₇	H	H	3,6-F ₂	2-CH ₃ -4-OCHF ₂	203-204
582	i-C ₃ H ₇	H	H	3,6-F ₂	2-CH ₃ -4-Cl	221-222
583	i-C ₃ H ₇	H	H	3,4,5,6-F ₄	2-CH ₃ -5-Cl	189-191
584	i-C ₃ H ₇	H	H	3-NO ₂	2,3-Cl ₂	201-203
585	i-C ₃ H ₇	H	H	3-NO ₂	H	236-238
586	i-C ₃ H ₇	H	H	3-NO ₂	2-Cl	190-192

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Table 1 (Cont'd)

	No	R ¹	R ²	R ³	Xn	Ym	Physical Properties (melting point: °C)
5	587	i-C ₃ H ₇	H	H	3-NO ₂	3-Cl	227-229
10	588	i-C ₃ H ₇	H	H	3-NO ₂	4-Cl	238-240
15	589	i-C ₃ H ₇	H	H	3-NO ₂	2-Br	170-172
20	590	i-C ₃ H ₇	H	H	3-NO ₂	3-Br	196-198
25	591	i-C ₃ H ₇	H	H	3-NO ₂	4-Br	205-207
30	592	i-C ₃ H ₇	H	H	3-NO ₂	2-F	199-201
35	593	i-C ₃ H ₇	H	H	3-NO ₂	3-F	228-230
40	594	i-C ₃ H ₇	H	H	3-NO ₂	4-F	250-252
45	595	i-C ₃ H ₇	H	H	3-NO ₂	4-I	187-189
50	596	i-C ₃ H ₇	H	H	3-NO ₂	4-NO ₂	201-203
	597	i-C ₃ H ₇	H	H	3-NO ₂	3-CN	220-222
	598	i-C ₃ H ₇	H	H	3-NO ₂	4-CN	226-228
	599	i-C ₃ H ₇	H	H	3-NO ₂	2-CH ₃	227-228
	600	i-C ₃ H ₇	H	H	3-NO ₂	3-CH ₃	195-197
	601	i-C ₃ H ₇	H	H	3-NO ₂	4-CH ₃	196-198
	602	i-C ₃ H ₇	H	H	3-NO ₂	2-C ₂ H ₅	189-191
	603	i-C ₃ H ₇	H	H	3-NO ₂	2-C ₃ H ₇ -i	190-192
	604	i-C ₃ H ₇	H	H	3-NO ₂	4-C ₃ H ₇ -i	221-223
	605	i-C ₃ H ₇	H	H	3-NO ₂	4-C ₄ H ₉ -n	193-195
	606	i-C ₃ H ₇	H	H	3-NO ₂	4-CF ₃	192-194
	607	i-C ₃ H ₇	H	H	3-NO ₂	3-CF ₃	220-222
	608	i-C ₃ H ₇	H	H	3-NO ₂	2-CF ₃	215-217
	609	i-C ₃ H ₇	H	H	3-NO ₂	4-CF ₂ CF ₂ CF ₃	184-185

Table 1 (Cont'd)

	No	R ¹	R ²	R ³	Xn	Ym	Physical Properties (melting point: °C)
10	610	i-C ₃ H ₇	H	H	3-NO ₂	4-CF(CF ₃) ₂	243-244
	611	i-C ₃ H ₇	H	H	3-NO ₂	4-(CF ₂) ₃ CF ₃	220-221
15	612	i-C ₃ H ₇	H	H	3-NO ₂	2-OCH ₃	172-174
	613	i-C ₃ H ₇	H	H	3-NO ₂	3-OCH ₃	201-203
20	614	i-C ₃ H ₇	H	H	3-NO ₂	4-OCH ₃	221-223
	615	i-C ₃ H ₇	H	H	3-NO ₂	3-O-C ₃ H ₇ -i	198-200
25	616	i-C ₃ H ₇	H	H	3-NO ₂	3-OCHF ₂	188-190
	617	i-C ₃ H ₇	H	H	3-NO ₂	4-OCHF ₂	222-224
30	618	i-C ₃ H ₇	H	H	3-NO ₂	4-OCF ₃	234-236
	619	i-C ₃ H ₇	H	H	3-NO ₂	4-OCF ₂ CHFOC ₃ F _{7-n}	138-140
35	620	i-C ₃ H ₇	H	H	3-NO ₂	4-COOCH ₃	192-194
	621	i-C ₃ H ₇	H	H	3-NO ₂	3-SCH ₃	205-207
40	622	i-C ₃ H ₇	H	H	3-NO ₂	2-SCH ₃	201-203
	623	i-C ₃ H ₇	H	H	3-NO ₂	3-SCF ₃	203-205
45	624	i-C ₃ H ₇	H	H	3-NO ₂	4-SCH ₂ CF ₃	155-156
	625	i-C ₃ H ₇	H	H	3-NO ₂	4-SCHF ₂	183-185
50	626	i-C ₃ H ₇	H	H	3-NO ₂	4-SCF ₂ CHF ₂	235-237
	627	i-C ₃ H ₇	H	H	3-NO ₂	4-SCF ₂ CF ₃	190-192
	628	i-C ₃ H ₇	H	H	3-NO ₂	4-SCF ₂ CBrF ₂	228-230
	629	i-C ₃ H ₇	H	H	3-NO ₂	4-SCF(CF ₃) ₂	242-243
	630	i-C ₃ H ₇	H	H	3-NO ₂	4-S(CF ₂) ₃ CF ₃	229-230
	631	i-C ₃ H ₇	H	H	3-NO ₂	4-SO(CF ₂) ₃ CF ₃	190-193
	632	i-C ₃ H ₇	H	H	3-NO ₂	4-O-Ph	228-230

Table 1 (Cont'd)

	No	R ¹	R ²	R ³	Xn	Yn	Physical Properties (melting point: °C)
5	633	i-C ₃ H ₇	H	H	3-NO ₂	2,4-Cl ₂	202-204
10	634	i-C ₃ H ₇	H	H	3-NO ₂	2,5-Cl ₂	230-232
15	635	i-C ₃ H ₇	H	H	3-NO ₂	2,6-Cl ₂	210-212
20	636	i-C ₃ H ₇	H	H	3-NO ₂	3,4-Cl ₂	227-229
25	637	i-C ₃ H ₇	H	H	3-NO ₂	3,5-Cl ₂	194-196
30	638	i-C ₃ H ₇	H	H	3-NO ₂	2,3-F ₂	184-186
35	639	i-C ₃ H ₇	H	H	3-NO ₂	2,4-F ₂	210-212
40	640	i-C ₃ H ₇	H	H	3-NO ₂	2,5-F ₂	191-193
45	641	i-C ₃ H ₇	H	H	3-NO ₂	2,6-F ₂	173-175
50	642	i-C ₃ H ₇	H	H	3-NO ₂	3,4-F ₂	241-243
	643	i-C ₃ H ₇	H	H	3-NO ₂	3-Cl-4-F	203-205
	644	i-C ₃ H ₇	H	H	3-NO ₂	2,3,4-Cl ₃	203-205
	645	i-C ₃ H ₇	H	H	3-NO ₂	2,3,4-F ₃	202-204
	646	i-C ₃ H ₇	H	H	3-NO ₂	2,3,4,5,6-F ₅	192-194
	647	i-C ₃ H ₇	H	H	3-NO ₂	2,3-(CH ₃) ₂	200-202
	648	i-C ₃ H ₇	H	H	3-NO ₂	2,4-(CH ₃) ₂	201-203
	649	i-C ₃ H ₇	H	H	3-NO ₂	2,5-(CH ₃) ₂	221-223
	650	i-C ₃ H ₇	H	H	3-NO ₂	2,6-(CH ₃) ₂	234-236
	651	i-C ₃ H ₇	H	H	3-NO ₂	3,4-(CH ₃) ₂	195-197
	652	i-C ₃ H ₇	H	H	3-NO ₂	2,4,6-(CH ₃) ₃	229-231
	653	i-C ₃ H ₇	H	H	3-NO ₂	2,6-(C ₂ H ₅) ₂	258-260
	654	i-C ₃ H ₇	H	H	3-NO ₂	3,5-(CF ₃) ₂	225-227
	655	i-C ₃ H ₇	H	H	3-NO ₂	3-Cl-4-CH ₃	208-210

Table 1 (Cont'd)

	No	R ¹	R ²	R ³	Xn	Ym	Physical Properties (melting point: °C)
10	656	i-C ₃ H ₇	H	H	3-NO ₂	2-Cl-4-CH ₃	195-197
	657	i-C ₃ H ₇	H	H	3-NO ₂	2-F-4-Cl-5-CH ₃	193-195
15	658	i-C ₃ H ₇	H	H	3-NO ₂	3-Cl-4-OCHF ₂	222-224
	659	i-C ₃ H ₇	H	H	3-NO ₂	3,5-Cl ₂ -4-OCHF ₂	218-220
20	660	i-C ₃ H ₇	H	H	3-NO ₂	2-Cl-4-CF ₃	217-219
	661	i-C ₃ H ₇	H	H	3-NO ₂	2-Cl-5-CF ₃	193-195
	662	i-C ₃ H ₇	H	H	3-NO ₂	2,6-Cl ₂ -4-CF ₃	226-228
	663	i-C ₃ H ₇	H	H	3-NO ₂	2-CH ₃ -3-Cl	198-200
25	664	i-C ₃ H ₇	H	H	3-NO ₂	2-CH ₃ -4-Cl	235-237
	665	i-C ₃ H ₇	H	H	3-NO ₂	2-CH ₃ -5-Cl	218-219
	666	i-C ₃ H ₇	H	H	3-NO ₂	2-CH ₃ -6-Cl	248-250
30	667	i-C ₃ H ₇	H	H	3-NO ₂	2-C ₂ H ₅ -4-Cl	235-237
	668	i-C ₃ H ₇	H	H	3-NO ₂	2-CH ₃ -4,5-Cl ₂	196-198
35	669	i-C ₃ H ₇	H	H	3-NO ₂	2,3-(CH ₃) ₂ -4-Cl	226-228
	670	i-C ₃ H ₇	H	H	3-NO ₂	2,4-(CH ₃) ₂ -3-Cl	203-205
	671	i-C ₃ H ₇	H	H	3-NO ₂	2-CH ₃ -4-Br	214-216
40	672	i-C ₃ H ₇	H	H	3-NO ₂	2-CH ₃ -5-Br	191-193
	673	i-C ₃ H ₇	H	H	3-NO ₂	2-CH ₃ -4-I	227-227
	674	i-C ₃ H ₇	H	H	3-NO ₂	2-CH ₃ -3-F	199-201
45	675	i-C ₃ H ₇	H	H	3-NO ₂	2-CH ₃ -4-F	226-228
	676	i-C ₃ H ₇	H	H	3-NO ₂	2-CH ₃ -5-F	213-215
	677	i-C ₃ H ₇	H	H	3-NO ₂	2-C ₂ H ₅ -5-F	191-193
50	678	i-C ₃ H ₇	H	H	3-NO ₂	3-CF ₃ -4-Cl	215-217

Table 1 (Cont'd)

	No	R ¹	R ²	R ³	Xn	Ym	Physical Properties (melting point: °C)
5	679	i-C ₃ H ₇	H	H	3-NO ₂	2-CF ₃ -4-Cl	208-210
10	680	i-C ₃ H ₇	H	H	3-NO ₂	3-CH ₃ -4-Br	199-201
15	681	i-C ₃ H ₇	H	H	3-NO ₂	2-CH ₃ -3-CF ₃	221-222
20	682	i-C ₃ H ₇	H	H	3-NO ₂	2-CH ₃ -4-CF ₃	236-237
25	683	i-C ₃ H ₇	H	H	3-NO ₂	2-CH ₃ -4-CF ₂ CF ₃	218-219
30	684	i-C ₃ H ₇	H	H	3-NO ₂	2-CH ₃ -4-CF ₂ CF ₂ CF ₃	188-189
35	685	i-C ₃ H ₇	H	H	3-NO ₂	2-CH ₃ -4-CF(CF ₃) ₂	248-250
40	686	i-C ₃ H ₇	H	H	3-NO ₂	2-CH ₃ -4-(CF ₂) ₃ CF ₃	225-226
45	687	i-C ₃ H ₇	H	H	3-NO ₂	2-CH ₃ -3-OCH ₃	198-200
50	688	i-C ₃ H ₇	H	H	3-NO ₂	2-CH ₃ -4-OCH ₃	208-210
	689	i-C ₃ H ₇	H	H	3-NO ₂	2,3-(CH ₃) ₂ -4-OCH ₃	253-255
	690	i-C ₃ H ₇	H	H	3-NO ₂	2-CH ₃ -4-O-C ₃ H ₇ -i	233-234
	691	i-C ₃ H ₇	H	H	3-NO ₂	3-CF ₃ -5-OCH ₃	214-216
	692	i-C ₃ H ₇	H	H	3-NO ₂	2-CF ₃ -4-OCHF ₂	201-203
	693	i-C ₃ H ₇	H	H	3-NO ₂	3-CF ₃ -4-OCHF ₂	231-232
	694	i-C ₃ H ₇	H	H	3-NO ₂	2,4-(CH ₃) ₂ -3-OCH ₃	201-203
	695	i-C ₃ H ₇	H	H	3-NO ₂	2-CH ₃ -3-OCHF ₂	200-202
	696	i-C ₃ H ₇	H	H	3-NO ₂	2-CH ₃ -4-OCHF ₂	186-188
	697	i-C ₃ H ₇	H	H	3-NO ₂	2-CH ₃ -4-OCH ₂ CF ₃	241-243
	698	i-C ₃ H ₇	H	H	3-NO ₂	2-CH ₃ -4-OCF ₂ CBrF ₂	229-230
	699	i-C ₃ H ₇	H	H	3-NO ₂	2-CH ₃ -4-OCH ₂ CF ₂ CHF ₂	199-200
	700	i-C ₃ H ₇	H	H	3-NO ₂	2-CH ₃ -4-OCF ₂ CBrFCF ₃	224-226
	701	i-C ₃ H ₇	H	H	3-NO ₂	2-CH ₃ -4-OCH ₂ CHFOCF ₃	208-210

Table 1 (Cont'd)

	No	R ¹	R ²	R ³	Xn	Yn	Physical Properties (melting point: °C)
10	702	i-C ₃ H ₇	H	H	3-NO ₂	3-OCH ₃ -4-OCHF ₂	242-243
	703	i-C ₃ H ₇	H	H	3-NO ₂	2-Cl-4-CF(CF ₃) ₂	198-200
15	704	i-C ₃ H ₇	H	H	3-NO ₂	2-Cl-4-OCF ₃	188-190
	705	i-C ₃ H ₇	H	H	3-NO ₂	2-Br-4-OCF ₃	202-203
20	706	i-C ₃ H ₇	H	H	3-NO ₂	2-CH ₃ -4-NO ₂	201-203
	707	i-C ₃ H ₇	H	H	3-NO ₂	2-Cl-5-NO ₂	193-195
25	708	i-C ₃ H ₇	H	H	3-NO ₂	2-CH ₃ -5-NO ₂	197-199
	709	i-C ₃ H ₇	H	H	3-NO ₂	2,3-(CH ₃) ₂ -4-NO ₂	207-209
30	710	i-C ₃ H ₇	H	H	3-NO ₂	2-CH ₃ -4-OCF ₃	184-186
	711	i-C ₃ H ₇	H	H	3-NO ₂	2-CH ₃ -4-OCBrF ₂	217-218
35	712	i-C ₃ H ₇	H	H	3-NO ₂	2-CH ₃ -4-OCF ₂ CHF ₂	205-207
	713	i-C ₃ H ₇	H	H	3-NO ₂	2-CH ₃ -3-OCF ₂ CHClF	164-166
40	714	i-C ₃ H ₇	H	H	3-NO ₂	2-CH ₃ -4-OCF ₂ CHClF	192-193
	715	i-C ₃ H ₇	H	H	3-NO ₂	2-CH ₃ -4-OCF ₂ CCl ₂ F	212-213
45	716	i-C ₃ H ₇	H	H	3-NO ₂	2-CH ₃ -4-OCF ₂ CHFCF ₃	198-199
	717	i-C ₃ H ₇	H	H	3-NO ₂	2-CH ₃ -3-Cl-4-OCHF ₂	236-238
50	718	i-C ₃ H ₇	H	H	3-NO ₂	2-CH ₃ -4-OCF ₂ CHF ₂ -5-Cl	233-234
	719	i-C ₃ H ₇	H	H	3-NO ₂	2-CH ₃ -4-SCH ₃	214-216
55	720	i-C ₃ H ₇	H	H	3-NO ₂	2,3-(CH ₃) ₂ -4-SCH ₃	254-256
	721	i-C ₃ H ₇	H	H	3-NO ₂	2-CH ₃ -4-SC ₃ H ₇ -i	209-211
60	722	i-C ₃ H ₇	H	H	3-NO ₂	2-CH ₃ -4-SCHF ₂	225-227
	723	i-C ₃ H ₇	H	H	3-NO ₂	2-CH ₃ -4-N(CH ₃) ₂	215-217
65	724	i-C ₃ H ₇	H	H	3-NO ₂	2-CH ₃ -4-(3-CF ₃ -PhO)	174-175

Table 1 (Cont'd)

	No	R ¹	R ²	R ³	Xn	Ym	Physical Properties (melting point: °C)
5	725	i-C ₃ H ₇	H	H	3-NO ₂	2-CH ₃ -4-(F ₅ -PhO)	242-244
10	726	i-C ₃ H ₇	H	H	3-NO ₂	2-CH ₃ -4-(2-Cl-4-CF ₃ -PhO)	191-192
15	727	i-C ₃ H ₇	H	H	3-NO ₂	2-CH ₃ -4-(4-Cl-PhS)	165-167
20	728	i-C ₃ H ₇	H	H	3-NO ₂	2-CH ₃ -4-(5-CF ₃ -2-Pyi-0)	216-218
25	729	i-C ₃ H ₇	H	H	3-NO ₂	2-CH ₃ -4-(3-Cl-5-CF ₃ -2-Pyi-S)	236-238
30	730	i-C ₃ H ₇	H	H	3-NO ₂	4-(3-Cl-5-CF ₃ -2-Pyi-S)	190-192
35	731	i-C ₃ H ₇	H	H	3-NO ₂	2-CH ₃ -4-P=O(OC ₂ H ₅) ₂	128-130
40	732	i-C ₃ H ₇	H	H	3-NO ₂	2-CH ₃ -4-P=S(OCH ₃) ₂	128-130
45	733	i-C ₃ H ₇	H	H	3-NO ₂	-3-OCH ₂ O-4-	229-231
50	734	i-C ₃ H ₇	H	H	3-NO ₂	3-CH ₂ CH ₂ CH ₂ -4	209-211
	735	i-C ₃ H ₇	H	H	3-NO ₂	2-CH ₂ CH ₂ CH ₂ -3	226-228
	736	i-C ₃ H ₇	H	H	3-NO ₂	3-N=C(CF ₃)-NH-4	162-164
	737	i-C ₃ H ₇	H	H	3-NO ₂	3-N=C(CF ₃)-N(CH ₃)-4	186-188
	738	i-C ₃ H ₇	H	H	5-NO ₂	2-CH ₃ -5-Cl	226-228
	739	i-C ₃ H ₇	H	H	6-NO ₂	2-CH ₃ -5-Cl	247-249
	740	i-C ₃ H ₇	H	H	6-NO ₂	2-Cl-4-CF ₃	Crystals
	741	i-C ₃ H ₇	H	H	6-NO ₂	2-Cl-4-CF ₂ CF ₂ CF ₃	192-193
	742	i-C ₃ H ₇	H	H	6-NO ₂	2-CH ₃ -4-CF ₃	239-240
	743	i-C ₃ H ₇	H	H	6-NO ₂	2-CH ₃ -4-OCF ₂ CHFCF ₃	252-253

Table 1 (Cont'd)

	No	R ¹	R ²	R ³	Xn	Ym	Physical Properties (melting point: °C)
5	744	i-C ₃ H ₇	H	H	3-CN	2-CH ₃ -4-Cl	162-164
10	745	i-C ₃ H ₇	H	H	6-CN	2-CH ₃ -4-Cl	Crystals
15	749	i-C ₃ H ₇	H	H	3-CH ₃	4-OCF ₃	180-182
20	750	i-C ₃ H ₇	H	H	3-CH ₃	2-CH ₃ -4-Cl	169-171
25	751	i-C ₃ H ₇	H	H	3-CH ₃	2-CH ₃ -4-OCHF ₂	192-193
30	752	i-C ₃ H ₇	H	H	5-CH ₃	2-CH ₃ -5-Cl	193-195
35	753	i-C ₃ H ₇	H	H	6-C ₂ H ₅	2-CH ₃ -4-Cl	180-182
40	754	i-C ₃ H ₇	H	H	3-CF ₃	H	202-204
45	755	i-C ₃ H ₇	H	H	3-CF ₃	2-CH ₃ -5-Cl	196-198
50	756	i-C ₃ H ₇	H	H	3-CF ₃	2-CH ₃ -3-Cl	216-218
	757	i-C ₃ H ₇	H	H	3-CF ₃	2,6-(C ₂ H ₅) ₂	238-239
	758	i-C ₃ H ₇	H	H	3-CF ₃	2-CH ₃ -4-Cl	207-209
	759	i-C ₃ H ₇	H	H	3-CF ₃	2-CH ₃ -4-OCHF ₂	212-213
	760	i-C ₃ H ₇	H	H	5-CF ₃	2,6-(C ₂ H ₅) ₂	240-241
	761	i-C ₃ H ₇	H	H	5-CF ₃	2-CH ₃ -4-Cl	203-205
	762	i-C ₃ H ₇	H	H	5-CF ₃	3-CF ₃ -5-OCH ₃	209-210
	763	i-C ₃ H ₇	H	H	5-CF ₃	2-CH ₃ -4-OCHF ₂	196-197
	764	i-C ₃ H ₇	H	H	6-CF ₃	H	152-154
	765	i-C ₃ H ₇	H	H	6-CF ₃	2-CH ₃ -3-Cl	158-160
	766	i-C ₃ H ₇	H	H	6-CF ₃	2-CH ₃ -5-Cl	273-275

Table 1 (Cont'd)

	No	R ¹	R ²	R ³	Xn	Ym	Physical Properties (melting point: °C)
5	767	i-C ₃ H ₇	H	H	3-OCH ₃	4-OCF ₃	178-180
10	768	i-C ₃ H ₇	H	H	3-OCH ₃	2-CH ₃ -4-Br	214-215
15	769	i-C ₃ H ₇	H	H	6-OCH ₃	4-OCF ₃	189-190
20	770	i-C ₃ H ₇	H	H	6-OCH ₃	2-CH ₃ -5-Cl	155-157
25	771	i-C ₃ H ₇	H	H	6-OCH ₃	2-CH ₃ -4-Br	195-197
30	772	i-C ₃ H ₇	H	H	3-OCHF ₂	2-CH ₃ -4-Cl	212-213
35	773	i-C ₃ H ₇	H	H	3-OCHF ₂	2-CH ₃ -5-Cl	198-200
40	774	i-C ₃ H ₇	H	H	3-OCHF ₂	2-CH ₃ -4-OCHF ₂	174-175
45	775	i-C ₃ H ₇	H	H	4-OCHF ₂	2-CH ₃ -5-Cl	215-217
50	776	i-C ₃ H ₇	H	H	5-OCHF ₂	2-CH ₃ -5-Cl	173-175
	777	i-C ₃ H ₇	H	H	6-OCHF ₂	2-CH ₃ -4-Cl	224-226
	778	i-C ₃ H ₇	H	H	6-OCHF ₂	2-CH ₃ -5-Cl	191-193
	779	i-C ₃ H ₇	H	H	6-OCHF ₂	2-CH ₃ -4-OCHF ₂	199-200
	780	i-C ₃ H ₇	H	H	3-SCH ₃	2-CH ₃ -3-Cl	191-193
	781	i-C ₃ H ₇	H	H	3-SCH ₃	2-CH ₃ -4-Cl	188-190
	782	i-C ₃ H ₇	H	H	3-SCH ₃	2-CH ₃ -4-Br	185-187
	783	i-C ₃ H ₇	H	H	3-SCH ₃	2-CH ₃ -4-OCHF ₂	159-161
	784	i-C ₃ H ₇	H	H	6-SCH ₃	2-CH ₃ -4-Br	201-202
	785	i-C ₃ H ₇	H	H	6-SCH ₃	2-CH ₃ -3-Cl	207-209
	786	i-C ₃ H ₇	H	H	6-SCH ₃	2-CH ₃ -4-Cl	204-206
	787	i-C ₃ H ₇	H	H	6-SCH ₃	2-CH ₃ -4-OCHF ₂	212-214
	788	i-C ₃ H ₇	H	H	3-SC ₃ H ₇ -i	2-CH ₃ -4-Cl	183-184
	789	i-C ₃ H ₇	H	H	6-SC ₃ H ₇ -i	2-CH ₃ -4-Cl	228-229

Table 1 (Cont'd)

No	R ¹	R ²	R ³	Xn	Yn	Physical Properties (melting point: °C)
790	i-C ₃ H ₇	H	H	3-SOCH ₃	2-CH ₃ -4-Br	125-130
791	i-C ₃ H ₇	H	H	3-SOCH ₃	2-CH ₃ -4-OCHF ₂	215-217
792	i-C ₃ H ₇	H	H	6-SOCH ₃	2-CH ₃ -4-Br	203-208
793	i-C ₃ H ₇	H	H	3-SOC ₃ H ₇ -i	2-CH ₃ -4-Cl	157-160
794	i-C ₃ H ₇	H	H	6-SOC ₃ H ₇ -i	2-CH ₃ -4-Cl	170-173
795	i-C ₃ H ₇	H	H	3-SO ₂ CH ₃	2-CH ₃ -4-OCHF ₂	211-213
796	i-C ₃ H ₇	H	H	3-SO ₂ C ₃ H ₇ -i	2-CH ₃ -4-Cl	240-242
797	i-C ₃ H ₇	H	H	3-SCH ₂ CF ₃	2-CH ₃ -4-OCHF ₂	184-186
798	i-C ₃ H ₇	H	H	6-SCH ₂ CF ₃	2-CH ₃ -4-OCHF ₂	239-241
799	i-C ₃ H ₇	H	H	3-SOCH ₂ CF ₃	2-CH ₃ -4-OCHF ₂	198-200
800	i-C ₃ H ₇	H	H	6-SOCH ₂ CF ₃	2-CH ₃ -4-OCHF ₂	238-240
801	i-C ₃ H ₇	H	H	6-C≡CH	2-CH ₃ -4-Cl	253-255
802	i-C ₃ H ₇	H	H	6-COOCH ₃	2-CH ₃ -4-Cl	149-151
803	i-C ₃ H ₇	H	H	3-CONHC ₃ H ₇ -i	2-CH ₃ -4-Cl	187-189
804	i-C ₃ H ₇	H	H	6-CONHC ₃ H ₇ -i	2-CH ₃ -4-Cl	191-193
807	i-C ₃ H ₇	H	H	3-Ph	2-CH ₃ -4-Cl	228-229
808	i-C ₃ H ₇	H	H	6-Ph	4-OCF ₃	213-214
809	i-C ₃ H ₇	H	H	6-Ph	2-CH ₃ -4-Cl	254-256
810	i-C ₃ H ₇	H	H	3-O-Ph	2-CH ₃ -4-OCHF ₂	175-177
811	i-C ₃ H ₇	H	H	6-O-Ph	2-CH ₃ -4-OCHF ₂	194-196
812	i-C ₃ H ₇	H	H	3-(4-Cl-PhO)	2-CH ₃ -4-Br	204-206

Table 1 (Cont'd)

No	R ¹	R ²	R ³	Xn	Ym	Physical Properties (melting point: °C)
813	i-C ₃ H ₇	H	H	3-S-Ph	2-CH ₃ -4-Cl	204-206
814	i-C ₃ H ₇	H	H	3-S-Ph	2-CH ₃ -4-Br	193-194
815	i-C ₃ H ₇	H	H	6-S-Ph	2-CH ₃ -4-Cl	211-213
816	i-C ₃ H ₇	H	H	6-S-Ph	2-CH ₃ -4-Br	193-194
817	i-C ₃ H ₇	H	H	3-SO-Ph	2-CH ₃ -4-Cl	201-203
818	i-C ₃ H ₇	H	H	3-SO ₂ -Ph	2-CH ₃ -4-Cl	189-191
819	i-C ₃ H ₇	H	H	3-CH=CH-CH=CH-4	2-CH ₃ -4-OCHF ₂	158-160
820	i-C ₃ H ₇	H	H	5-CH=CH-CH=CH-6	2-CH ₃ -4-OCHF ₂	154-155
821	i-C ₃ H ₇	H	H	3-CH=CH-CH=CH-4	2-CH ₃ -5-Cl	156-158
822	i-C ₃ H ₇	H	H	4-CH=CH-CH=CH-5	2-CH ₃ -5-Cl	229-231
823	i-C ₃ H ₇	H	H	5-CH=CH-CH=CH-6	2-CH ₃ -5-Cl	232-234
824	i-C ₃ H ₇	CH ₃	H	H	4-CF ₃	178-180
825	i-C ₃ H ₇	CH ₃	H	3-NO ₂	2-CH ₃ -4-OCHF ₂	148-149
826	i-C ₃ H ₇	CH ₃	H	H	2-CH ₃ -4-Cl	82-83
827	i-C ₃ H ₇	H	CH ₃	H	2-CH ₃ -4-Cl	165-166
828	i-C ₃ H ₇	CH ₂ OCH ₃	H	H	2-CH ₃ -4-Cl	oil
829	n-C ₄ H ₉	H	H	H	4-CF ₃	171-173
830	n-C ₄ H ₉	H	H	3-NO ₂	2-CH ₃ -5-Cl	172-174
831	i-C ₄ H ₉	H	H	3-NO ₂	2-CH ₃ -5-Cl	186-188
832	i-C ₄ H ₉	H	H	3-NO ₂	2-CH ₃ -4-OCHF ₂	192-193
833	i-C ₄ H ₉	H	H	H	4-CF ₃	149-151
834	i-C ₄ H ₉	CH ₃	H	6-NO ₂	2-CH ₃ -4-OCHF ₂	135-137

Table 1 (Cont'd)

	No	R ¹	R ²	R ³	Xn	Ym	Physical Properties (melting point: °C)
10	835	s-C ₄ H ₉	H	H	H	4-CF ₃	194-195
	836	s-C ₄ H ₉	H	H	3-Cl	2-CH ₃ -4-OCHF ₂	203-205
15	837	s-C ₄ H ₉	H	H	6-Cl	2-CH ₃ -4-OCHF ₂	213-215
	838	s-C ₄ H ₉	H	H	3-NO ₂	2-CH ₃ -5-Cl	205-207
	839	s-C ₄ H ₉	H	H	3-NO ₂	2-CH ₃ -4-OCHF ₂	228-229
20	840	t-C ₄ H ₉	H	H	H		237-239
	841	t-C ₄ H ₉	H	H	H	2-CH ₃ -5-Cl	200-202
	842	t-C ₄ H ₉	H	H	3-NO ₂	2-CH ₃ -5-Cl	256-258
25	843	t-C ₄ H ₉	H	H	3-NO ₂	2-CH ₃ -4-OCHF ₂	172-173
	844	CH ₂ C(CH ₃) ₃	H	H	3-NO ₂	2-CH ₃ -4-OCHF ₂	226-227
	845	CH(C ₂ H ₅) ₂	H	H	3-NO ₂	2-CH ₃ -4-OCHF ₂	245-246
30	846	CH(CH ₃)CH(CH ₃) ₂	H	H	3-NO ₂	2-CH ₃ -4-OCHF ₂	245-247
	847	n-C ₈ H ₁₇	H	H	3-NO ₂	2-CH ₃ -5-Cl	164-166
35	848	c-C ₃ H ₅	H	H	H	4-CF ₃	195-197
	849	c-C ₃ H ₅	H	H	3-Cl	2-CH ₃ -4-OCHF ₂	156-158
	850	c-C ₃ H ₅	H	H	6-Cl	2-CH ₃ -4-OCHF ₂	179-181
40	851	c-C ₃ H ₅	H	H	3-NO ₂	2-CH ₃ -5-Cl	194-196
	852	c-C ₃ H ₅	H	H	3-NO ₂	2-CH ₃ -4-OCHF ₂	191-192
	853	c-C ₄ H ₇	H	H	H	2-CH ₃ -5-Cl	205-207
45	854	c-C ₄ H ₇	H	H	3-NO ₂	2-CH ₃ -5-Cl	206-208
	855	c-C ₄ H ₇	H	H	3-NO ₂	2-CH ₃ -5-F	199-201
	856	c-C ₅ H ₉	H	H	3-NO ₂	2-CH ₃ -4-OCHF ₂	219-220
50	857	c-C ₅ H ₉	H	H	H	4-CF ₃	208-210

Table 1 (Cont'd)

	No	R ¹	R ²	R ³	Xn	Ym	Physical Properties (melting point: °C)
5	858	c-C ₅ H ₉	H	H	3-NO ₂	2-CH ₃ -5-Cl	200-202
10	859	c-C ₆ H ₁₁	H	H	3-NO ₂	2-CH ₃ -5-Cl	225-227
15	860	CH ₂ -C ₃ H ₅ -c	H	H	3-NO ₂	2-CH ₃ -5-F	190-192
20	861	CH ₂ CH ₂ Cl	H	H	3-NO ₂	2-CH ₃ -5-F	179-181
25	862	CH ₂ CH ₂ F	H	H	3-NO ₂	2-CH ₃ -5-F	179-181
30	863	CH ₂ CH ₂ F	H	H	3-NO ₂	2-CH ₃ -4-OCHF ₂	190-191
35	864	CH ₂ CF ₃	H	H	H	2-CH ₃ -5-Cl	187-189
40	865	CH ₂ CH=CH ₂	H	H	H	4-CF ₃	161-163
45	866	CH ₂ CH=CH ₂	H	H	3-NO ₂	2-CH ₃ -5-Cl	175-177
50	867	CH ₂ CH=CH ₂	H	H	3-NO ₂	2-CH ₃ -4-OCHF ₂	194-195
	868	CH ₂ C≡CH	H	H	H	4-CF ₃	185-188
	869	CH ₂ C≡CH	H	H	3-NO ₂	2-CH ₃ -5-Cl	191-193
	870	CH ₂ C≡CH	H	H	3-NO ₂	2-CH ₃ -4-OCHF ₂	190-191
	871	CH ₂ CH ₂ OCH ₃	H	H	3-NO ₂	2-CH ₃ -5-Cl	165-167
	872	CH ₂ CH ₂ OCH ₃	H	H	3-NO ₂	2-CH ₃ -4-OCHF ₂	165-167
	873	CH(CH ₃)CH ₂ OCH ₃	H	H	H	4-CF ₃	252-253
	874	CH(CH ₃)CH ₂ OCH ₃	H	H	3-NO ₂	2-CH ₃ -4-OCHF ₂	153-155
	875	CH ₂ CH(OC ₂ H ₅) ₂	H	H	3-NO ₂	2-CH ₃ -4-OCHF ₂	149-151
	876	CH ₂ -Ph	H	H	H	4-CF ₃	148-150
	877	CH ₂ -Ph	H	H	3-NO ₂	2-CH ₃ -5-Cl	196-198
	878	CH(CH ₃)-Ph	H	H	3-NO ₂	2-CH ₃ -5-Cl	168-170
	879	CH(CH ₃)-Ph	H	H	3-NO ₂	2-CH ₃ -4-OCHF ₂	187-189

Table 1 (Cont'd)

	No	R ¹	R ²	R ³	Xn	Ym	Physical Properties (melting point: °C)
10	880	CH ₂ CH ₂ O-(2,4-(CH ₃) ₂ -Ph)	H	H	3-NO ₂	2-CH ₃ -5-Cl	126-128
15	881	-CH ₂ CH ₂ CH ₂ CH ₂ -	H	H		4-CF ₃	170-171
18	882	-CH ₂ CH ₂ CH ₂ CH ₂ -	H	6-NO ₂		2-CH ₃ -5-Cl	157-159
20	883	-CH ₂ CH ₂ CH ₂ CH ₂ -	H	6-NO ₂		2-CH ₃ -4-OCHF ₂	163-165
25	884	-CH ₂ CH ₂ OCH ₂ CH ₂ -	H	H		4-CF ₃	167-168
30	885	-CH ₂ CH ₂ OCH ₂ CH ₂ -	H	6-NO ₂		2-CH ₃ -5-Cl	192-194
35	886	-CH ₂ CH ₂ OCH ₂ CH ₂ -	H	6-NO ₂		2-CH ₃ -4-OCHF ₂	186-188
40	887	-CH ₂ CH(CH ₃)OCH(CH ₃)CH ₂ -	H	6-NO ₂		3-CF ₃ -5-OCH ₃	164-165
45	888	CH ₂ -3-Pyi	H	H	3-NO ₂	2-CH ₃ -4-Br	180-182
50	889	i-C ₃ H ₇	H	H	H	4-CF ₂ CF ₃	155-157
	890	i-C ₃ H ₇	H	H	3-NO ₂	4-CF ₂ CF ₃	223-225
	891	i-C ₃ H ₇	H	H	3-F	4-CF ₂ CF ₃	199-201
	892	i-C ₃ H ₇	H	H	6-F	4-CF ₂ CF ₃	213-215
	893	i-C ₃ H ₇	H	H	3-Cl	4-CF ₂ CF ₃	214-216
	894	i-C ₃ H ₇	H	H	6-Cl	4-CF ₂ CF ₃	225-227
	895	i-C ₃ H ₇	H	H	3-I	4-CF ₂ CF ₃	208-210
	896	i-C ₃ H ₇	H	H	6-I	4-CF ₂ CF ₃	224-226
	897	i-C ₃ H ₇	H	H	H	2-CH ₃ -4-OSO ₂ -(4-CH ₃ -Ph)	135-137
	898	i-C ₃ H ₇	H	H	3-NO ₂	2-CH ₃ -4-OSO ₂ -(4-CH ₃ -Ph)	208-210

Table 1 (Cont'd)

	No	R ¹	R ²	R ³	Xn	Yn	Physical Properties (melting point: °C)
5	899	i-C ₃ H ₇	H	H	3-Cl	2-CH ₃ -4-OSO ₂ - (4-CH ₃ -Ph)	187-189
10	900	i-C ₃ H ₇	H	H	6-Cl	2-CH ₃ -4-OSO ₂ - (4-CH ₃ -Ph)	218-220
15	901	i-C ₃ H ₇	H	H	3-F	2-F-4-O-(4-CF ₃ -2- Cl-Ph)	137-139
20	902	i-C ₃ H ₇	H	H	6-F	2-F-4-O-(4-CF ₃ -2- Cl-Ph)	155-157
25	903	i-C ₃ H ₇	H	H	3-Cl	2-F-4-O-(4-CF ₃ -2- Cl-Ph)	119-121
30	904	i-C ₃ H ₇	H	H	6-Cl	2-F-4-O-(4-CF ₃ -2- Cl-Ph)	154-156
35	905	i-C ₃ H ₇	H	H	3-F	2-CH ₃ -4-SF ₂ CF ₃	140-142
40	906	i-C ₃ H ₇	H	H	6-F	2-CH ₃ -4-SF ₂ CF ₃	162-164
45	907	i-C ₃ H ₇	H	H	3-Cl	2-CH ₃ -4-SF ₂ CF ₃	172-173
50	908	i-C ₃ H ₇	H	H	6-Cl	2-CH ₃ -4-SF ₂ CF ₃	193-195
	909	i-C ₃ H ₇	H	H	3-I	2-CH ₃ -4-SF ₂ CF ₃	207-209
	910	i-C ₃ H ₇	H	H	6-I	2-CH ₃ -4-SF ₂ CF ₃	196-198
	911	i-C ₃ H ₇	H	H	3-Cl	4-CH=C(Cl)CF ₃	196.3-208.2
	912	i-C ₃ H ₇	H	H	6-Cl	4-CH=C(Cl)CF ₃	202.8-209.4
	913	i-C ₃ H ₇	H	H	3-Cl	4-CH=CBBr ₂	209.8-214.8
	914	i-C ₃ H ₇	H	H	6-Cl	4-CH=CCl ₂	207.7-213.9
	915	i-C ₃ H ₇	H	H	3-Cl	4-CH=CCl ₂	120.1

Table 1 (Cont'd)

	No	R ¹	R ²	R ³	Xn	Yn	Physical Properties (melting point: °C)
10	916	i-C ₃ H ₇	H	H	6-Cl	4-CH=CCl ₂	199.7
	917	i-C ₃ H ₇	H	H	3-I	4-CH=C(Cl)CF ₃	196.6
15	918	i-C ₃ H ₇	H	H	6-I	4-CH=C(Cl)CF ₃	203.3
	919	i-C ₃ H ₇	H	H	3-I	2-C ₂ H ₅ -4-I	195.5
20	920	i-C ₃ H ₇	H	H	6-I	2-C ₂ H ₅ -4-I	242.3
	921	C ₂ H ₅	H	H	H	2-C ₂ H ₅ -3-Cl-6-C ₂ H ₅	171-173
25	922	i-C ₃ H ₇	H	H	H	2-C ₂ H ₅ -3-Cl-6-C ₂ H ₅	185-186
	923	t-C ₄ H ₉	H	H	H	2-C ₂ H ₅ -3-Cl-6-C ₂ H ₅	166-167
30	924	i-C ₃ H ₇	H	H	3-Cl	2-C ₂ H ₅ -3-Cl-6-C ₂ H ₅	260-261
	925	i-C ₃ H ₇	H	H	3-I	2-C ₂ H ₅ -3-Cl-6-C ₂ H ₅	269-271
35	926	t-C ₄ H ₉	H	H	3-Cl	2-C ₂ H ₅ -3-Cl-6-C ₂ H ₅	221-222
	927	t-C ₄ H ₉	H	H	H	2-CH ₃ -4-Cl	216-218
40	928	t-C ₄ H ₉	H	H	H	4-CF ₃	220-221
	929	t-C ₄ H ₉	H	H	H	4-OCF ₃	178-179
45	930	t-C ₄ H ₉	H	H	H	2-CH ₃ -4-OCF ₃	184-185
	931	t-C ₄ H ₉	H	H	H	2-CH ₃ -4-CF ₂ CF ₃	223-224
50	932	t-C ₄ H ₉	H	H	3-Cl	2-CH ₃ -4-CF ₂ CF ₃	219-220
	933	t-C ₄ H ₉	H	CH ₃	H	4-OCF ₃	155-158
	934	t-C ₄ H ₉	H	H	3-Cl	4-CF ₃	228-229
	935	t-C ₄ H ₉	H	H	6-Cl	4-CF ₃	253-255
	936	t-C ₄ H ₉	H	H	3-Cl	4-OCF ₃	268-270
	937	t-C ₄ H ₉	H	H	3-Cl	2-CH ₃ -4-Cl	242-244
	938	t-C ₄ H ₉	H	H	6-Cl	2-CH ₃ -4-Cl	262-264

Table 1 (Cont'd)

	No	R ¹	R ²	R ³	Xn	Yn	Physical Properties (melting point: °C)
5	939	t-C ₄ H ₉	H	H	3-I	4-CF ₃	268-269
10	940	t-C ₄ H ₉	H	H	3-I	4-OCF ₃	263-265
15	941	t-C ₄ H ₉	H	H	3-I	2-CH ₃ -4-Cl	218-220
20	942	t-C ₄ H ₉	H	H	3-I	2-CH ₃ -4-CF ₂ CF ₃	205-207
25	943	t-C ₄ H ₉	H	H	6-I	2-CH ₃ -4-CF ₂ CF ₃	216-217
30	944	t-C ₄ H ₉	H	H	3-Cl	2-CH ₃ -4-OCF ₃	260-262
35	945	n-C ₄ H ₉	H	H	3-I	2-CH ₃ -4-CF ₂ CF ₃	173.1-178.5
40	946	n-C ₄ H ₉	H	H	6-I	2-CH ₃ -4-CF ₂ CF ₃	181.8-187.7
45	947	n-C ₅ H ₁₁	H	H	3-I	2-CH ₃ -4-CF ₂ CF ₃	140.2-151.4
50	948	n-C ₅ H ₁₁	H	H	6-I	2-CH ₃ -4-CF ₂ CF ₃	168.7-171.3
	949	n-C ₆ H ₁₃	H	H	3-I	2-CH ₃ -4-CF ₂ CF ₃	135.5-143.9
	950	n-C ₆ H ₁₃	H	H	6-I	2-CH ₃ -4-CF ₂ CF ₃	167.1-169.9
	951	i-C ₃ H ₇	H	H	3-I	2-C ₂ H ₅ -4-I	254.8-273.8
	952	i-C ₃ H ₇	H	H	3-I	2-n-C ₃ H ₇ -4-I	179.7
	953	i-C ₃ H ₇	H	H	3-CH ₃	2-CH ₃ -4-CF ₂ CF ₃	184-186
	954	i-C ₃ H ₇	H	H	6-CH ₃	2-CH ₃ -4-CF ₂ CF ₃	177-179
	955	t-C ₄ H ₉	H	H	3-CH ₃	2-CH ₃ -4-CF ₂ CF ₃	198-200
	956	t-C ₄ H ₉	H	H	6-CH ₃	2-CH ₃ -4-CF ₂ CF ₃	236-237
	957	t-C ₄ H ₉	H	H	3-I	2-CH ₃ -4-OCF ₃	208-210
	958	t-C ₄ H ₉	H	H	6-I	2-CH ₃ -4-OCF ₃	253-255
	959	n-C ₃ H ₇	H	H	3-I	2-CH ₃ -3-Cl	190-192
	960	n-C ₃ H ₇	H	H	6-I	2-CH ₃ -3-Cl	159-161
	961	n-C ₃ H ₇	H	H	6-I	2-C ₂ H ₅ -3-Cl-6-C ₂ H ₅	225-228

Table 1 (Cont'd)

	No	R ¹	R ²	R ³	Xn	Ym	Physical Properties (melting point: °C)
10	962	i-C ₃ H ₇	H	H	3-NO ₂	4-OCOCF ₃	185-187
	963	i-C ₃ H ₇	H	H	3-Cl	4-OCOCF ₃	Paste
	964	i-C ₃ H ₇	H	H	3-I	4-OCOCF ₃	Paste
15	965	i-C ₃ H ₇	H	H	3-I	2-i-C ₃ H ₇ -4-I	132.5
	966	i-C ₃ H ₇	H	H	3-I	2-n-C ₄ H ₉ -4-I	194.2-198.3
	967	i-C ₃ H ₇	H	H	3-I	2-CH ₃ -4-Br-6-CH ₃	119.1
20	968	i-C ₃ H ₇	H	H	3-Cl	4-CO ₂ CH(CF ₃) ₂	168-170
	969	i-C ₃ H ₇	H	H	3-I	4-CO ₂ CH(CF ₃) ₂	193-195
	970	i-C ₃ H ₇	H	H	3-NO ₂	4-CO ₂ CH(CF ₃) ₂	215-217
25	971	i-C ₃ H ₇	H	H	3-Cl	2-CH ₃ -4-C≡C- (2,4-Cl ₂ -Ph)	123-125
	972	i-C ₃ H ₇	H	H	3-I	2-CH ₃ -4-C≡C- (2,4-Cl ₂ -Ph)	138-140
	973	i-C ₃ H ₇	H	H	3-Cl	3-OCF ₂ CF ₂ -4	125-128
30	974	i-C ₃ H ₇	H	H	3-I	3-OCF ₂ CF ₂ -4	123-126
	975	i-C ₃ H ₇	H	H	H	3-OCF ₂ CF ₂ O-4	152-154
	976	i-C ₃ H ₇	H	H	3-NO ₂	3-OCF ₂ CF ₂ O-4	247-248
35	977	i-C ₃ H ₇	H	H	3-Cl	3-OCF ₂ CF ₂ O-4	224-226
	978	i-C ₃ H ₇	H	H	H	4-C(CF ₃) ₂ OH	87-89
	979	i-C ₃ H ₇	H	H	3-NO ₂	4-C(CF ₃) ₂ OH	205-207
40	980	i-C ₃ H ₇	H	H	3-Cl	4-C(CF ₃) ₂ OH	187-189
	981	CH ₂ CH ₂ OCH ₃	H	H	3-I	2-CH ₃ -4-CF ₂ CF ₃	145.3-151.7
	982	CH ₂ CH ₂ OCH ₃	H	H	6-I	2-CH ₃ -4-CF ₂ CF ₃	166.7-169.4

Table 1 (Cont'd)

	No	R ¹	R ²	R ³	Xn	Ym	Physical Properties (melting point: °C)
5	983	CH ₂ CH ₂ OC ₂ H ₅	H	H	3-I	2-CH ₃ -4-CF ₂ CF ₃	146.5-150.3
10	984	CH ₂ CH ₂ OC ₂ H ₅	H	H	6-I	2-CH ₃ -4-CF ₂ CF ₃	157.3-160.4
15	985	(CH ₂) ₃ OCH ₃	H	H	3-I	2-CH ₃ -4-CF ₂ CF ₃	151.9-155.8
20	986	(CH ₂) ₃ OCH ₃	H	H	6-I	2-CH ₃ -4-CF ₂ CF ₃	156.5-158.8
25	987	CH ₂ CH=CH ₂	H	H	3-I	2-CH ₃ -4-CF ₂ CF ₃	157.5
30	988	CH ₂ CH=CH ₂	H	H	6-I	2-CH ₃ -4-CF ₂ CF ₃	164.6-171.3
35	989	CH ₂ C≡CH	H	H	3-I	2-CH ₃ -4-CF ₂ CF ₃	153.6-158.4
40	990	CH ₂ C≡CH	H	H	6-I	2-CH ₃ -4-CF ₂ CF ₃	171.5-178.1
45	991	c-C ₅ H ₉	H	H	3-I	2-CH ₃ -4-CF ₂ CF ₃	212.9
50	992	c-C ₅ H ₉	H	H	6-I	2-CH ₃ -4-CF ₂ CF ₃	205.2
	993	c-C ₆ H ₁₁	H	H	3-I	2-CH ₃ -4-CF ₂ CF ₃	219.7-224.3
	994	c-C ₆ H ₁₁	H	H	6-I	2-CH ₃ -4-CF ₂ CF ₃	239.0-244.4
	995	i-C ₃ H ₇	H	H	H	4-SCF ₃	182-184
	996	i-C ₃ H ₇	H	H	3-NO ₂	4-SCF ₃	228-229
	997	i-C ₃ H ₇	H	H	3-Cl	4-SCF ₃	229-231
	998	i-C ₃ H ₇	H	H	3-I	4-SCF ₃	226-227
	999	i-C ₃ H ₇	H	H	H	4-SOCF ₃	175-178
	1000	i-C ₃ H ₇	H	H	3-NO ₂	4-SOCF ₃	202-205
	1001	i-C ₃ H ₇	H	H	3-Cl	4-SOCF ₃	242-244
	1002	i-C ₃ H ₇	H	H	3-I	4-SOCF ₃	229-231
	1003	i-C ₃ H ₇	H	H	3-I	3-OCF ₂ CF ₂ O-4	163-165
	1004	i-C ₃ H ₇	H	H	3-I	4-C(CF ₃) ₂ OH	227-229
	1005	i-C ₄ H ₉	H	H	3-I	2-CH ₃ -4-CF ₂ CF ₃	200.4-206.8

Table 1 (Cont'd)

No	R ¹	R ²	R ³	Xn	Y _m	Physical Properties (melting point: °C)
1006	i-C ₄ H ₉	H	H	6-I	2-CH ₃ -4-CF ₂ CF ₃	179.2-181.8
1007	s-C ₄ H ₉	H	H	3-I	2-CH ₃ -4-CF ₂ CF ₃	226.0-230.9
1008	s-C ₄ H ₉	H	H	6-I	2-CH ₃ -4-CF ₂ CF ₃	216.1-218.0
1009	s-C ₅ H ₁₁	H	H	3-I	2-CH ₃ -4-CF ₂ CF ₃	215.3-218.2
1010	s-C ₅ H ₁₁	H	H	6-I	2-CH ₃ -4-CF ₂ CF ₃	191.4-210.5
1011	CH(C ₂ H ₅) ₂	H	H	3-I	2-CH ₃ -4-CF ₂ CF ₃	234.8-236.9
1012	CH(C ₂ H ₅) ₂	H	H	6-I	2-CH ₃ -4-CF ₂ CF ₃	253.7-255.7
1013	CH(C ₂ H ₅)CH ₂ O	H	H	3-I	2-CH ₃ -4-CF ₂ CF ₃	177
1014	CH(C ₂ H ₅)CH ₂ O	H	H	6-I	2-CH ₃ -4-CF ₂ CF ₃	198.3-201.0
1015	i-C ₅ H ₁₁	H	H	3-I	2-CH ₃ -4-CF ₂ CF ₃	190.0-192.5
1016	i-C ₅ H ₁₁	H	H	6-I	2-CH ₃ -4-CF ₂ CF ₃	187.8
1017	i-C ₃ H ₇	H	H	3-I	2-C ₂ H ₅ -4-CF ₂ CF ₃	232.5-235.8
1018	t-C ₄ H ₉	H	H	H	2-CH ₃ -4-OCHF ₂	138-140
1019	t-C ₄ H ₉	H	H	3-Cl	2-CH ₃ -4-OCHF ₂	206-208
1020	t-C ₄ H ₉	H	H	3-I	2-CH ₃ -4-OCHF ₂	204-206
1021	t-C ₄ H ₉	H	H	H	2-Cl-4-OCF ₃	162-164
1022	t-C ₄ H ₉	H	H	3-Cl	2-Cl-4-OCF ₃	189-191
1023	t-C ₄ H ₉	H	H	3-I	2-Cl-4-OCF ₃	188-190
1024	c-C ₃ H ₅	H	H	3-I	2-CH ₃ -4-CF ₂ CF ₃	156.0-165.0
1025	c-C ₃ H ₅	H	H	6-I	2-CH ₃ -4-CF ₂ CF ₃	173.2-176.4

Table 1 (Cont'd)

No	R ¹	R ²	R ³	Xn	Ym	Physical Properties (melting point: °C)
1026	CH ₂ CH(CH ₃) -C ₂ H ₅	H	H	3-I	2-CH ₃ -4-CF ₂ CF ₃	148.6
1027	CH ₂ CH(CH ₃) -C ₂ H ₅	H	H	6-I	2-CH ₃ -4-CF ₂ CF ₃	157.8
1028	CH ₂ -c-C ₆ H ₁₁	H	H	3-I	2-CH ₃ -4-CF ₂ CF ₃	186.8-188.7
1029	CH ₂ (4-t-C ₄ H ₉ -c-C ₆ H ₁₁)	H	H	3-I	2-CH ₃ -4-CF ₂ CF ₃	226.0-231.2
1030	CH ₂ (4-t-C ₄ H ₉ -c-C ₆ H ₁₁)	H	H	6-I	2-CH ₃ -4-CF ₂ CF ₃	215.4
1031	CH(CH ₃)CH ₂ O -CH ₃	H	H	3-I	2-CH ₃ -4-CF ₂ CF ₃	187.2-189.9
1032	CH(CH ₃)CH ₂ O -CH ₃	H	H	6-I	2-CH ₃ -4-CF ₂ CF ₃	169.7-176.1
1033	CH(CH ₃)CH -(CH ₃) ₂	H	H	3-I	2-CH ₃ -4-CF ₂ CF ₃	208.3-212.7
1034	CH(CH ₃)CH -(CH ₃) ₂	H	H	6-I	2-CH ₃ -4-CF ₂ CF ₃	219.3-223.0
1035	C ₂ H ₅	C ₂ H ₅	H	3-I	2-CH ₃ -4-CF ₂ CF ₃	131.3
1036	C ₂ H ₅	C ₂ H ₅	H	6-I	2-CH ₃ -4-CF ₂ CF ₃	137
1037	t-C ₄ H ₉	H	H	H	2-CH ₃ -4-CF(CF ₃) ₂	172-175
1038	t-C ₄ H ₉	H	H	3-Cl	2-CH ₃ -4-CF(CF ₃) ₂	241-243
1039	t-C ₄ H ₉	H	H	3-I	2-CH ₃ -4-CF(CF ₃) ₂	238-240
1040	CH ₂ CF ₃	H	H	3-I	2-CH ₃ -4-CF ₂ CF ₃	166.1-175.5

Table 1 (Cont'd)

	No	R ¹	R ²	R ³	Xn	Yn	Physical Properties (melting point: °C)
5	1041	CH ₂ CF ₃	H	H	6-I	2-CH ₃ -4-CF ₂ CF ₃	184.7-202.5
10	1042	i-C ₃ H ₇	CH ₃	H	3-I	2-CH ₃ -4-CF ₂ CF ₃	201.4
15	1043	i-C ₄ H ₉	CH ₃	H	3-I	2-CH ₃ -4-CF ₂ CF ₃	183.5-189.0
20	1044	n-C ₃ H ₇	n-C ₃ H ₇	H	3-I	2-CH ₃ -4-CF ₂ CF ₃	142.6-145.4
25	1045	CH ₂ CH=CH ₂	CH ₂ CH	H	3-I	2-CH ₃ -4-CF ₂ CF ₃	100.2-105.6
30	1046	CH ₂ CH ₂ O	CH ₂ CH ₂ O	H	3-I	2-CH ₃ -4-CF ₂ CF ₃	84.0-87.3
35	1047		=CH ₂				
40	1048	C ₂ H ₅	C ₂ H ₅	H	3-I	2-CH ₃ -4-CF ₂ CF ₃	119.1
45	1049	t-C ₄ H ₉	H	H	H	2-CH ₃ -4-OCBrF ₂	195-197
50	1050	t-C ₄ H ₉	H	H	3-Cl	2-CH ₃ -4-OCBrF ₂	198-200
	1051	t-C ₄ H ₉	H	H	3-I	2-CH ₃ -4-OCBrF ₂	196-198
	1052	t-C ₄ H ₉	H	H	H	4-C(CF ₃) ₂ OH	123-125
	1053	t-C ₄ H ₉	H	H	3-Cl	4-C(CF ₃) ₂ OH	185-187
	1054	t-C ₄ H ₉	H	H	3-I	4-C(CF ₃) ₂ OH	203-205
	1055	i-C ₃ H ₇	H	H	3-I	2,4-F ₂	236-237
	1056	C ₂ H ₅	H	H	3-I	2-CH ₃ -4-OCF ₂	176-178
	1057	C ₂ H ₅	H	H	6-I	2-CH ₃ -4-OCF ₂	207-209
	1058	n-C ₃ H ₇	H	H	3-I	2-CH ₃ -4-OCF ₂	185-187
						-CHF ₂	

Table 1 (Cont'd)

	No	R ¹	R ²	R ³	Xn	Ym	Physical Properties (melting point: °C)
5	1059	n-C ₃ H ₇	H	H	6-I	2-CH ₃ -4-OCF ₂ -CHF ₂	215-217
10	1060	t-C ₄ H ₉	H	H	H	2-CH ₃ -4-OCF ₂ -CHF ₂	197-198
15	1061	t-C ₄ H ₉	H	H	3-Cl	2-CH ₃ -4-OCF ₂ -CHF ₂	192-194
20	1062	t-C ₄ H ₉	H	H	3-I	2-CH ₃ -4-OCF ₂ -CHF ₂	217-218
25	1063	i-C ₃ H ₇	H	H	3-Cl	2-CH ₃ -4-O-(3,5 -(CH ₃ O) ₂ -2-Pym)	186-188
30	1064	i-C ₃ H ₇	H	H	3-I	2-CH ₃ -4-O-(3,5 -(CH ₃ O) ₂ -2-Pym)	201-202
35	1065	t-C ₄ H ₉	H	H	H	3-OCF ₂ CF ₂ O-4	156-158
40	1066	t-C ₄ H ₉	H	H	3-Cl	3-OCF ₂ CF ₂ O-4	240-241
45	1067	t-C ₄ H ₉	H	H	3-I	3-OCF ₂ CF ₂ O-4	252-253
50	1068	CH ₃	CH ₃	H	3-I	2-CH ₃ -4-CF ₂ CF ₃	148.7
55	1069	n-C ₃ H ₇	CH ₃	H	3-I	2-CH ₃ -4-CF ₂ CF ₃	129.3
60	1070	CH ₂ CH ₂ OCH ₂ CH ₂	H	3-I	2-CH ₃ -4-CF ₂ CF ₃	164.7	
65	1071	i-C ₃ H ₇	i-C ₃ H ₇	H	H	2-CH ₃ -4-CF ₂ CF ₃	169.1
70	1072	i-C ₃ H ₇	i-C ₃ H ₇	H	6-I	2-CH ₃ -4-CF ₂ CF ₃	201.2
75	1073	C ₂ H ₅	H	H	3-I	2-CH ₃ -4-CF(CF ₃) ₂	194-195

Table 1 (Cont'd)

No	R ¹	R ²	R ³	Xn	Ym	Physical Properties (melting point: °C)
1074	C ₂ H ₅	H	H	6-I	2-CH ₃ -4-CF(CF ₃) ₂	218-220
1075	n-C ₃ H ₇	H	H	3-I	2-CH ₃ -4-CF(CF ₃) ₂	188-190
1076	n-C ₃ H ₇	H	H	6-I	2-CH ₃ -4-CF(CF ₃) ₂	201-203
1077	i-C ₃ H ₇	H	H	H	4-SO ₂ CF ₃	184-186
1078	i-C ₃ H ₇	H	H	3-Cl	4-SO ₂ CF ₃	239-241
1079	i-C ₃ H ₇	H	H	3-I	4-SO ₂ CF ₃	225-227
1080	t-C ₄ H ₉	H	H	3-I	4-SO ₂ CF ₃	230-232
1081	i-C ₃ H ₇	i-C ₃ H ₇	H	3-I	2-CH ₃ -4-CF ₂ CF ₃	Paste
1082	CH ₂ CH ₂ CH ₂ CH ₂ CH ₂		H	3-I	2-CH ₃ -4-CF ₂ CF ₃	140.0-146.8
1083	CH ₂ CH ₂ CH(CH ₃)CH ₂		H	3-I	2-CH ₃ -4-CF ₂ CF ₃	171.4
		-CH ₂ -				
1086	i-C ₃ H ₇		H	H	2-CH ₃ -4-OCF ₂ CF ₂	138-140
					-Ph	
1087	i-C ₃ H ₇		H	H	2-CH ₃ -4-OCF ₂ CF ₂	160-162
					-Ph	
1088	i-C ₃ H ₇		H	H	2-CH ₃ -4-OCF ₂ CF ₂	209-211
					-Ph	
1089	i-C ₃ H ₇		H	H	2-CH ₃ -4-OCF ₂ CF ₂	190-192
				NO ₂	-Ph	

50

55

Table 1 (Cont'd)

No	R ¹	R ²	R ³	Xn	Ym	Physical Properties (melting point: °C)
1090	i-C ₃ H ₇	H	H	H	2-CH ₃ -4-SCH ₂ CH ₂ -CF=CF ₂	190-192
1091	i-C ₃ H ₇	H	H	H	2-CH ₃ -4-SOCH ₂ CH ₂ -CF=CF ₂	149-153
1092	i-C ₃ H ₇	H	H	H	2-CH ₃ -4-SO ₂ CH ₂ -CH ₂ CF=CF ₂	183-185
1093	i-C ₃ H ₇	H	H	3-Cl	2-CH ₃ -4-SCH ₂ CH ₂ -CF=CF ₂	168-170
1094	i-C ₃ H ₇	H	H	3-Cl	2-CH ₃ -4-SOCH ₂ CH ₂ -CF=CF ₂	164-167
1095	i-C ₃ H ₇	H	H	3-Cl	2-CH ₃ -4-SO ₂ CH ₂ -CH ₂ CF=CF ₂	181-183
1096	i-C ₃ H ₇	H	H	3-I	2-CH ₃ -4-SCH ₂ CH ₂ -CF=CF ₂	193-195
1097	i-C ₃ H ₇	H	H	3-I	2-CH ₃ -4-SOCH ₂ CH ₂ -CF=CF ₂	182-186
1098	i-C ₃ H ₇	H	H	3-I	2-CH ₃ -4-SO ₂ CH ₂ -CH ₂ CF=CF ₂	208-210
1099	i-C ₃ H ₇	H	H	H	3-OCF ₂ O-4	216-218
1100	i-C ₃ H ₇	H	H	3- NO ₂	3-OCF ₂ O-4	227-229
1101	i-C ₃ H ₇	H	H	3-Cl	3-OCF ₂ O-4	243-245
1102	i-C ₃ H ₇	H	H	3-I	3-OCF ₂ O-4	229-231

Table 1 (Cont'd)

No	R ¹	R ²	R ³	Xn	Ym	Physical Properties (melting point: °C)	
10	1103	t-C ₄ H ₉	H	H	3-OCF ₂ O-4	209-211	
	1104	t-C ₄ H ₉	H	H	3-Cl	3-OCF ₂ O-4	206-208
15	1105	t-C ₄ H ₉	H	H	3-I	3-OCF ₂ O-4	228-230
	1106	i-C ₃ H ₇	H	H	H	4-SCBrF ₂	175-177
20	1107	i-C ₃ H ₇	H	H	H	4-SOCBrF ₂	158-161
	1108	i-C ₃ H ₇	H	H	3-NO ₂	4-SCBrF ₂	180-182
25	1109	i-C ₃ H ₇	H	H	3-NO ₂	4-SOCBrF ₂	195-198
	1110	i-C ₃ H ₇	H	H	3-Cl	4-SCBrF ₂	156-158
30	1111	i-C ₃ H ₇	H	H	3-Cl	4-SOCBrF ₂	218-220
	1112	i-C ₃ H ₇	H	H	3-I	4-SCBrF ₂	206-208
35	1113	i-C ₃ H ₇	H	H	3-I	4-SOCBrF ₂	158-160
	1114	t-C ₄ H ₉	H	H	3-Cl	4-SCBrF ₂	210-212
40	1115	t-C ₄ H ₉	H	H	3-I	4-SCBrF ₂	219-220
	1116	C ₂ H ₅	C ₂ H ₅	H	3-I	2-CH ₃ -4-CF ₂ CF ₃	179.8-183.7
45	1117	CH ₂ CH ₂ CH ₂ -CH ₂ CH ₂ CH ₂		H	3-I	2-CH ₃ -4-CF ₂ CF ₃	170.7
	1118	C ₂ H ₅	C ₂ H ₅	H	3-NO ₂	2-CH ₃ -4-OCF ₃	161.9
50	1119	C ₂ H ₅	C ₂ H ₅	H	3-NO ₂	2-CH ₃ -4-CF(CF ₃) ₂	169.1
	1120	CH ₃	CH ₃	CH ₃	3-I	2-CH ₃ -4-CF ₂ CF ₃	141.9-146.6
55	1121	i-C ₃ H ₇	CH ₃	CH ₃	3-I	2-CH ₃ -4-CF ₂ CF ₃	Paste
	1122	C ₂ H ₅	C ₂ H ₅	CH ₃	3-I	2-CH ₃ -4-CF ₂ CF ₃	Paste
60	1123	i-C ₃ H ₇	H	H	H	4-SCF ₃	135-137
	1124	i-C ₃ H ₇	H	H	3-NO ₂	4-SCF ₃	187-189

Table 1 (Cont'd)

	No	R ¹	R ²	R ³	Xn	Yn	Physical Properties (melting point: °C)
5	1125	i-C ₃ H ₇	H	H	3-Cl	4-S <i>CF</i> ₃	192-194
10	1126	i-C ₃ H ₇	H	H	3-I	4-S <i>CF</i> ₃	194-196
15	1127	t-C ₄ H ₉	H	H	3-I	4-S <i>CF</i> ₃	195-197
20	1128	C ₂ H ₅	C ₂ H ₅	H	3-I	4-S <i>CF</i> ₃	173-175
25	1129	C ₂ H ₅	C ₂ H ₅	H	3-I	3-O <i>CF</i> ₂ O-4	128-130
30	1130	C ₂ H ₅	C ₂ H ₅	H	3-I	4-C(CF ₃) ₂ OH	152-154
35	1131	C ₂ H ₅	C ₂ H ₅	H	3-NO ₂	2-CH ₃ -4-O <i>CF</i> ₃	178.7-182.6
40	1132	C ₂ H ₅	C ₂ H ₅	H	3-NO ₂	2-CH ₃ -4-O <i>CF</i> ₂ CHF ₂	160.8-165.0
45	1133	C ₂ H ₅	C ₂ H ₅	H	3-NO ₂	2-Cl-4-CF ₂ CF ₃	91.9-95.2
50	1134	C ₂ H ₅	C ₂ H ₅	H	3-NO ₂	2-F-4-CF ₂ CF ₃	162.6-166.8
	1135	C ₂ H ₅	C ₂ H ₅	H	3-NO ₂	2-CH ₃ -4-Cl	188.8-190.8
	1136	C ₂ H ₅	C ₂ H ₅	H	3-NO ₂	4-O <i>CF</i> ₃	185.7-187.9
	1137	C ₂ H ₅	C ₂ H ₅	H	6-NO ₂	2-CH ₃ -4-O <i>CF</i> ₂ CHF ₂	111.2
	1138	C ₂ H ₅	C ₂ H ₅	H	6-NO ₂	2-CH ₃ -4-Cl	149.7
	1139	C ₂ H ₅	C ₂ H ₅	H	6-NO ₂	4-O <i>CF</i> ₃	173.4
	1140	CH ₂ CH(CH ₃)CH ₂ -CH(CH ₃)CH ₂		H	6-I	2-CH ₃ -4-CF ₂ CF ₃	166.4
	1141	t-C ₄ H ₉	H	H	3-I	2-CH ₃ -4-CF ₃	197-198
	1142	i-C ₃ H ₇	H	H	3-I	3-N=C(CF ₂ CF ₃)O-4	214-216
	1143	t-C ₄ H ₉	H	H	3-I	3-N=C(CF ₂ CF ₃)O-4	253-254
	1144	C ₂ H ₅	C ₂ H ₅	H	3-I	2-CH ₃ -4-CF ₃	160-161
	1145	i-C ₃ H ₇	H	H	H	3-OCHFCF ₂ O-4	102-104
	1146	i-C ₃ H ₇	H	H	3-NO ₂	3-OCHFCF ₂ O-4	190-192

Table 1 (Cont'd)

No	R ¹	R ²	R ³	Xn	Yn	Physical Properties (melting point: °C)
1147	i-C ₃ H ₇	H	H	3-Cl	3-OCHFCF ₂ O-4	123-125
1148	i-C ₃ H ₇	H	H	3-I	3-OCHFCF ₂ O-4	218-220
1149	t-C ₄ H ₉	H	H	H	3-OCHFCF ₂ O-4	165-167
1150	t-C ₄ H ₉	H	H	3-I	3-OCHFCF ₂ O-4	240-241
1151	C ₂ H ₅	C ₂ H ₅	H	3-I	3-OCHFCF ₂ O-4	193-195
1152	t-C ₅ H ₁₁	H	H	3-F	2-CH ₃ -4-CF ₂ CF ₃	223.3
1153	t-C ₅ H ₁₁	H	H	3-F	2-CH ₃ -4- CF(CF ₃) ₂	222
1154	t-C ₅ H ₁₁	H	H	3-F	2-CH ₃ -4-OCF ₃	193.6-195.8
1155	t-C ₅ H ₁₁	H	H	3-F	2-CH ₃ -4-OCHF ₂	165.5-174.0
1156	n-C ₃ H ₇	n-C ₃ H ₇	H	3-I	2-CH ₃ -4-OCF ₃	132.2-135.0
1157	n-C ₃ H ₇	n-C ₃ H ₇	H	3-I	2-CH ₃ -4-OCHF ₂	81.4-87.8
1158	n-C ₃ H ₇	n-C ₃ H ₇	H	3-I	2-CH ₃ -4- OCF ₂ CHF ₂	116.3
1159	i-C ₃ H ₇	C ₂ H ₅	H	3-I	2-CH ₃ -4-CF ₂ CF ₃	124.4
1160	i-C ₃ H ₇	C ₂ H ₅	H	3-I	4-OCF ₃	137.3-144.1
1161	i-C ₃ H ₇	H	H	3-I	3-OCF ₂ CHFO-4	161-163
1162	i-C ₃ H ₇	H	H	3-NO ₂	3-OCF ₂ CHFO-4	238-240
1163	i-C ₃ H ₇	H	H	3-Cl	3-OCF ₂ CHFO-4	243-245
1164	i-C ₃ H ₇	H	H	3-I	3-OCF ₂ CHFO-4	192-194
1165	t-C ₄ H ₉	H	H	H	3-OCF ₂ CHFO-4	205-207
1166	t-C ₄ H ₉	H	H	3-I	3-OCF ₂ CHFO-4	238-240
1167	C ₂ H ₅	C ₂ H ₅	H	3-I	3-OCF ₂ CHFO-4	195-197

Table 1 (Cont'd)

	No	R ¹	R ²	R ³	Xn	Ym	Physical Properties (melting point: °C)
10	1168	i-C ₃ H ₇	H	H	3-I	2-CH ₃ -4-SOCF ₃	148-152
15	1169	t-C ₄ H ₉	H	H	3-I	2-CH ₃ -4-SOCF ₃	165-168
20	1173	i-C ₃ H ₇	H	H	3-I	3-N=C(4-CF ₃ -Ph) -O-4	253-255
25	1174	t-C ₄ H ₉	H	H	3-I	3-N=C(4-CF ₃ -Ph) -O-4	251-253
30	1175	C ₂ H ₅	C ₂ H ₅	H	3-I	3-N=C(4-CF ₃ -Ph) -O-4	231-233
35	1176	i-C ₃ H ₇	H	H	3-I	3-O-C(2-CF ₃ -Ph) =N-4	242-244
40	1177	t-C ₄ H ₉	H	H	3-I	3-O-C(2-CF ₃ -Ph) =N-4	229-231
45	1178	C ₂ H ₅	C ₂ H ₅	H	3-I	3-O-C(2-CF ₃ -Ph) =N-4	203-205
50	1179	C ₂ H ₅	C ₂ H ₅	C ₂ H ₅	3-I	2-CH ₃ -4-CF ₂ CF ₃	Paste
	1180	i-C ₃ H ₇	H	H	3-I	3-O-C(CF ₂ CF ₃) =N-4	130-132
	1181	t-C ₄ H ₉	H	H	3-I	3-O-C(CF ₂ CF ₃) =N-4	205-207
	1182	C ₂ H ₅	C ₂ H ₅	H	3-I	3-O-C(CF ₂ CF ₃) =N-4	188-190
	1183	i-C ₃ H ₇	H	H	3-CF ₃	2-CH ₃ -4-OCF ₃	222-224
	1184	i-C ₃ H ₇	H	H	3-CF ₃	2-CH ₃ -4-CF ₂ CF ₃	219-221

Table 1 (Cont'd)

	No	R ¹	R ²	R ³	Xn	Yn	Physical Properties (melting point: °C)
10	1185	C ₂ H ₅	C ₂ H ₅	H	3-CF ₃	2-CH ₃ -4-OCF ₃	192-194
	1186	C ₂ H ₅	C ₂ H ₅	H	3-CF ₃	2-CH ₃ -4-CF ₂ CF ₃	218-220
15	1187	i-C ₃ H ₇	H	H	3-Cl	2-F-4-OCF ₃	126-128
	1188	i-C ₃ H ₇	H	H	3-I	2-F-4-OCF ₃	220-222
20	1189	t-C ₄ H ₉	H	H	3-I	2-F-4-OCF ₃	198-200
	1190	C ₂ H ₅	C ₂ H ₅	H	3-I	2-F-4-OCF ₃	129-131
25	1191	i-C ₃ H ₇	H	H	3-OCF ₃	2-CH ₃ -4-CF ₂ CF ₃	190-192
	1192	t-C ₄ H ₉	H	H	3-OCF ₃	2-CH ₃ -4-CF ₂ CF ₃	205-207
30	1193	C ₂ H ₅	C ₂ H ₅	H	3-OCF ₃	2-CH ₃ -4-CF ₂ CF ₃	146-148
	1202	i-C ₃ H ₇	H	H	4-I	2-CH ₃ -4-CF ₂ CF ₃	197-199
35	1203	i-C ₃ H ₇	H	H	5-I	2-CH ₃ -4-CF ₂ CF ₃	201-203
	1204	i-C ₃ H ₇	H	H	4-I	2-CH ₃ -4-OCHF ₂	241-243
40	1205	i-C ₃ H ₇	H	H	5-I	2-CH ₃ -4-OCHF ₂	214-216
	1206	i-C ₃ H ₇	H	H	3-CF ₃	2-CH ₃ -4-OCF ₂ CHF ₂	195-197
45	1207	i-C ₃ H ₇	H	H	3-CF ₃	2-CH ₃ -4-CF(CF ₃) ₂	227-229
	1208	i-C ₃ H ₇	H	H	H	2-C ₂ H ₅ -4-OCF ₃	160-162
50	1209	i-C ₃ H ₇	H	H	3-Cl	2-C ₂ H ₅ -4-OCF ₃	205-207
	1210	i-C ₃ H ₇	H	H	3-I	2-C ₂ H ₅ -4-OCF ₃	241-243
55	1211	t-C ₄ H ₉	H	H	3-I	2-C ₂ H ₅ -4-OCF ₃	224-225
	1212	C ₂ H ₅	C ₂ H ₅	H	3-I	2-C ₂ H ₅ -4-OCF ₃	141-143
60	1221	i-C ₃ H ₇	H	H	3,4-Cl ₂	2-CH ₃ -4-OCF ₃	199-200
	1222	i-C ₃ H ₇	H	H	3,4-Cl ₂	2-CH ₃ -4-CF ₂ CF ₃	208-209
65	1223	i-C ₃ H ₇	H	H	3,4-Cl ₂	2-CH ₃ -4-CF(CF ₃) ₂	228-229

Table 1 (Cont'd)

	No	R ¹	R ²	R ³	Xn	Ym	Physical Properties (melting point: °C)
5	1224	i-C ₃ H ₇	H	H	3,5-Cl ₂	2-CH ₃ -4-OCF ₃	228-230
10	1225	i-C ₃ H ₇	H	H	3,5-Cl ₂	2-CH ₃ -4-CF ₂ CF ₃	219-220
15	1226	i-C ₃ H ₇	H	H	3,5-Cl ₂	2-CH ₃ -4-CF(CF ₃) ₂	211-212
20	1227	i-C ₃ H ₇	H	H	3-Cl-4-F	2-CH ₃ -4-OCF ₃	184-186
25	1228	i-C ₃ H ₇	H	H	3-Cl-4-F	2-CH ₃ -4-CF ₂ CF ₃	178-180
30	1229	i-C ₃ H ₇	H	H	3-Cl-4-F	2-CH ₃ -4-CF(CF ₃) ₂	200-201
35	1230	t-C ₄ H ₉	H	H	3-CF ₃	2-CH ₃ -4-OCF ₃	209-210
40	1231	t-C ₄ H ₉	H	H	3-CF ₃	2-CH ₃ -4-CF ₂ CF ₃	210-211
45	1232	t-C ₄ H ₉	H	H	3-CF ₃	2-CH ₃ -4-CF(CF ₃) ₂	242-243
50	1233	i-C ₃ H ₇	H	H	3-OCF ₃	2-CH ₃ -4-OCF ₃	219-220
	1234	t-C ₄ H ₉	H	H	3-OCF ₃	2-CH ₃ -4-OCF ₃	222-223
	1235	C ₂ H ₅	C ₂ H ₅	H	3-OCF ₃	2-CH ₃ -4-OCF ₃	125-126
	1236	i-C ₃ H ₇	H	H	3-OCF ₃	2-CH ₃ -4-CF(CF ₃) ₂	235-236
	1237	t-C ₄ H ₉	H	H	3-OCF ₃	2-CH ₃ -4-CF(CF ₃) ₂	220-222
	1238	C ₂ H ₅	C ₂ H ₅	H	3-OCF ₃	2-CH ₃ -4-CF(CF ₃) ₂	156-157
	1245	i-C ₃ H ₇	H	H	3-CN	2-CH ₃ -4-CF ₂ CF ₃	168-170
	1246	i-C ₃ H ₇	H	H	4-I	2-CH ₃ -4-OCF ₃	238-240
	1247	i-C ₃ H ₇	H	H	5-I	2-CH ₃ -4-OCF ₃	205-206
	1248	i-C ₃ H ₇	H	H	4-I	2-CH ₃ -4-OCF ₂ CHF ₂	222-223

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Table 1 (Cont'd)

	No	R ¹	R ²	R ³	Xn	Ym	Physical Properties (melting point: °C)
10	1249	i-C ₃ H ₇	H	H	5-I	2-CH ₃ -4-OCF ₂ CHF ₂	203-204
	1250	i-C ₃ H ₇	H	H	4-I	2-CH ₃ -4-CF(CF ₃) ₂	215-216
15	1251	i-C ₃ H ₇	H	H	5-I	2-CH ₃ -4-CF(CF ₃) ₂	216-217
	1256	i-C ₃ H ₇	H	H	3-Cl -4-F	2-CH ₃ -4-CF ₂ CF ₃	235-236
20	1257	t-C ₄ H ₉	H	H	3-Cl -4-F	2-CH ₃ -4-CF ₂ CF ₃	225-226
	1258	C ₂ H ₅	C ₂ H ₅	H	3-Cl -4-F	2-CH ₃ -4-CF ₂ CF ₃	155-156
25	1259	i-C ₃ H ₇	H	H	3-Cl -4-F	2-CH ₃ -4-OCF ₃	229-231
	1260	t-C ₄ H ₉	H	H	3-Cl -4-F	2-CH ₃ -4-OCF ₃	237-238
30	1261	C ₂ H ₅	C ₂ H ₅	H	3-Cl -4-F	2-CH ₃ -4-OCF ₃	140-141
	1262	i-C ₃ H ₇	H	H	3-Cl -4-F	2-CH ₃ -4- CF(CF ₃) ₂	264-265
35	1263	t-C ₄ H ₉	H	H	3-Cl -4-F	2-CH ₃ -4- CF(CF ₃) ₂	253-154
	1264	C ₂ H ₅	C ₂ H ₅	H	3-Cl -4-F	2-CH ₃ -4- CF(CF ₃) ₂	158-159
40	1266	i-C ₃ H ₇	H	H	3,4- Br ₂	2-CH ₃ -4- CF ₂ CF ₃	162-164
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Table 1 (Cont'd)

	No	R ¹	R ²	R ³	Xn	Ym	Physical Properties (melting point: °C)
5	1277	i-C ₃ H ₇	H	H	4-Cl	2-CH ₃ -4- CF ₂ CF ₃	185-186
10	1278	t-C ₄ H ₉	H	H	4-Cl	2-CH ₃ -4- CF ₂ CF ₃	206-207
15	1280	C ₂ H ₅	C ₂ H ₅	H	4-Cl	2-CH ₃ -4- CF ₂ CF ₃	163-164
20	1281	C ₂ H ₅	C ₂ H ₅	H	4-Cl	2-CH ₃ -4- -6-I CF ₂ CF ₃	193-194
25	1283	i-C ₃ H ₇	H	H	3,4-F ₂	2-CH ₃ -4-OCF ₃	194-195
	1284	t-C ₄ H ₉	H	H	3,4-F ₂	2-CH ₃ -4-OCF ₃	216-217
	1285	C ₂ H ₅	C ₂ H ₅	H	3,4-F ₂	2-CH ₃ -4-OCF ₃	156-157
30	1287	i-C ₃ H ₇	H	H	4,5-F ₂	2-CH ₃ -4-OCF ₃	195-196
	1288	t-C ₄ H ₉	H	H	4,5-F ₂	2-CH ₃ -4-OCF ₃	223-224
	1290	i-C ₃ H ₇	H	H	3-I	2-CH ₃ -4-OC -(CF ₂ CF ₃)=C -(CF ₃) ₂	226-227
35	1291	i-C ₃ H ₇	H	H	3-Cl	2-CH ₃ -4-OC -(CF ₂ CF ₃)=C -(CF ₃) ₂	204-205
40	1292	i-C ₃ H ₇	H	H	3-I	2-CH ₃ -4-OC -(OCH ₃)=C -(CF ₃) ₂	198-199
45	1293	i-C ₃ H ₇	H	H	3-Cl	2-CH ₃ -4-OC -(OCH ₃)=C -(CF ₃) ₂	179-180
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Table 1 (Cont'd)

	No	R ¹	R ²	R ³	Xn	Ym	Physical Properties (melting point: °C)
10	1294	CH(CH ₃)CH ₂ OH	H	H	H	2-CH ₃ -4-C ₂ F ₅	73-74
	1295	i-C ₃ H ₇	H	H	6-Cl	2-OCH ₃ -5-Ph	120
15	1296	i-C ₃ H ₇	H	H	3-Cl	2-OCH ₃ -5-Ph	195
	1297	n-C ₃ H ₇	H	H	6-Cl	2-OCH ₃ -5-Ph	200
20	1298	CH(CH ₃)CH ₂ OH	H	H	3-Cl	2-CH ₃ -4-C ₂ F ₅	195
	1299	CH(C ₂ H ₅)CH ₂ OH	H	H	H	2-CH ₃ -4-C ₂ F ₅	78
25	1300	CH(CH ₃)CH ₂ OH	H	H	3-I	2-CH ₃ -4-C ₂ F ₅	98-99
	1301	i-C ₃ H ₇	H	H	3-Cl	2-CH ₃ -4-C≡C -C ₄ H ₉ -t	210
30	1302	i-C ₃ H ₇	H	H	6-Cl	2-CH ₃ -4-C≡C -C ₄ H ₉ -t	205
	1303	n-C ₃ H ₇	H	H	3-I	2-CH ₃ -4-C ₂ F ₅	200
35	1304	n-C ₃ H ₇	H	H	6-I	2-CH ₃ -4-C ₂ F ₅	195
	1305	i-C ₃ H ₇	H	H	3-I	2-CH ₃ -4-C≡C -C ₄ H ₉ -t	205
40	1306	i-C ₃ H ₇	H	H	6-I	2-CH ₃ -4-C≡C- -C ₄ H ₉ -t	170
	1307	CH ₂ -Ph	H	H	3-Cl	2-CH ₃ -4-C ₂ F ₅	175
45	1308	CH ₂ -Ph	H	H	6-Cl	2-CH ₃ -4-C ₂ F ₅	175
	1309	CH ₂ -(2-Cl-Ph)	H	H	3-Cl	2-CH ₃ -4-C ₂ F ₅	170
50	1310	CH ₂ -(2-Cl-Ph)	H	H	6-Cl	2-CH ₃ -4-C ₂ F ₅	210
	1311	CH ₃	H	H	3-I	2-CH ₃ -4-C ₂ F ₅	190
55	1312	CH ₃	H	H	6-I	2-CH ₃ -4-C ₂ F ₅	200

Table 1 (Cont'd)

	No	R ¹	R ²	R ³	Xn	Ym	Physical Properties (melting point: °C)
10	1313	C ₂ H ₅	H	H	3-I	2-CH ₃ -4-C ₂ F ₅	182
15	1314	C ₂ H ₅	H	H	6-I	2-CH ₃ -4-C ₂ F ₅	205
20	1315	CH ₂ CH(OH)CH ₃	H	H	3-Cl	2-CH ₃ -4-C ₂ F ₅	187
25	1316	CH(C ₂ H ₅)CH ₂ OH	H	H	3-Cl	2-CH ₃ -4-C ₂ F ₅	208
30	1317	C(CH ₃) ₂ CH ₂ OH	H	H	3-Cl	2-CH ₃ -4-C ₂ F ₅	181-182
35	1318	CH ₂ CH(OH)C ₂ H ₅	H	H	3-Cl	2-CH ₃ -4-C ₂ F ₅	171-172
40	1319	CH ₂ CH ₂ -Ph	H	H	3-Cl	2-CH ₃ -4-C ₂ F ₅	150
45	1320	CH ₂ CH ₂ -Ph	H	H	6-Cl	2-CH ₃ -4-C ₂ F ₅	190
50	1321	CH(CH ₃)-Ph	H	H	3-Cl	2-CH ₃ -4-C ₂ F ₅	160
	1322	CH(CH ₃)-Ph	H	H	6-Cl	2-CH ₃ -4-C ₂ F ₅	190
	1323	i-C ₃ H ₇	H	H	3-Cl	2-CH ₃ -4 -CH ₂ CH ₂ C(CH ₃) ₃	220
	1324	i-C ₃ H ₇	H	H	6-Cl	2-CH ₃ -4 -CH ₂ CH ₂ C(CH ₃) ₃	205
	1325	i-C ₃ H ₇	H	H	3-Cl	2-CH ₃ -4-C≡C-Ph	215
	1326	i-C ₃ H ₇	H	H	6-Cl	2-CH ₃ -4-C≡C-Ph	230
	1327	O-n-C ₃ H ₇	H	H	3-Cl	2-CH ₃ -4-C ₂ F ₅	165
	1328	O-n-C ₃ H ₇	H	H	6-Cl	2-CH ₃ -4-C ₂ F ₅	150
	1329	O-CH ₂ CH=CHCl (E)	H	H	3-Cl	2-CH ₃ -4-C ₂ F ₅	150
	1330	i-C ₃ H ₇	H	H	3-Cl	2-CH ₃ -4-CN	230
	1331	(CH ₂) ₃ -Ph	H	H	3-Cl	2-CH ₃ -4-C ₂ F ₅	112
	1332	(CH ₂) ₃ -Ph	H	H	6-Cl	2-CH ₃ -4-C ₂ F ₅	105

Table 1 (Cont'd)

	No	R ¹	R ²	R ³	Xn	Ym	Physical Properties (melting point: °C)
10	1333	CH ₂ (4-Cl-Ph)	H	H	3-Cl	2-CH ₃ -4-C ₂ F ₅	198
	1334	CH ₂ (4-Cl-Ph)	H	H	6-Cl	2-CH ₃ -4-C ₂ F ₅	156
15	1335	CH ₂ (3-Cl-Ph)	H	H	3-Cl	2-CH ₃ -4-C ₂ F ₅	168
	1336	CH ₂ (3-Cl-Ph)	H	H	6-Cl	2-CH ₃ -4-C ₂ F ₅	177
20	1337	CH ₂ (2-CH ₃ -Ph)	H	H	3-Cl	2-CH ₃ -4-C ₂ F ₅	152
	1338	CH ₂ (2-CH ₃ -Ph)	H	H	6-Cl	2-CH ₃ -4-C ₂ F ₅	147
25	1339	CH ₂ (3-CH ₃ -Ph)	H	H	3-Cl	2-CH ₃ -4-C ₂ F ₅	Crystals
	1340	CH ₂ (3-CH ₃ -Ph)	H	H	6-Cl	2-CH ₃ -4-C ₂ F ₅	173
30	1341	CH ₂ (4-CH ₃ -Ph)	H	H	3-Cl	2-CH ₃ -4-C ₂ F ₅	175
	1342	CH ₂ (4-CH ₃ -Ph)	H	H	6-Cl	2-CH ₃ -4-C ₂ F ₅	Crystals
35	1343	CH ₂ (2-CH ₃ O-Ph)	H	H	3-Cl	2-CH ₃ -4-C ₂ F ₅	Crystals
	1344	CH ₂ (2-CH ₃ O-Ph)	H	H	6-Cl	2-CH ₃ -4-C ₂ F ₅	176
40	1345	CH ₂ (3-CH ₃ O-Ph)	H	H	3-Cl	2-CH ₃ -4-C ₂ F ₅	73
	1346	CH ₂ (3-CH ₃ O-Ph)	H	H	6-Cl	2-CH ₃ -4-C ₂ F ₅	86
45	1347	CH ₂ (4-CH ₃ O-Ph)	H	H	3-Cl	2-CH ₃ -4-C ₂ F ₅	169
	1348	CH ₂ (4-CH ₃ O-Ph)	H	H	6-Cl	2-CH ₃ -4-C ₂ F ₅	168
50	1349	CH ₂ (2,4-Cl ₂ -Ph)	H	H	3-Cl	2-CH ₃ -4-C ₂ F ₅	169
	1350	CH ₂ (2,4-Cl ₂ -Ph)	H	H	6-Cl	2-CH ₃ -4-C ₂ F ₅	205
	1351	CH ₂ (3,4-Cl ₂ -Ph)	H	H	3-Cl	2-CH ₃ -4-C ₂ F ₅	179
55	1352	CH ₂ (3,4-Cl ₂ -Ph)	H	H	6-Cl	2-CH ₃ -4-C ₂ F ₅	192
	1353	CH ₂ (2,3-Cl ₂ -Ph)	H	H	3-Cl	2-CH ₃ -4-C ₂ F ₅	179
	1354	CH ₂ (2,3-Cl ₂ -Ph)	H	H	6-Cl	2-CH ₃ -4-C ₂ F ₅	208
	1355	CH ₂ -2-Pyi	H	H	3-Cl	2-CH ₃ -4-C ₂ F ₅	143

Table 1 (Cont'd)

	No	R ¹	R ²	R ³	Xn	Ym	Physical Properties (melting point: °C)
5	1356	(CH ₂) ₂ (2-Cl-Ph)	H	H	3-Cl	2-CH ₃ -4-C ₂ F ₅	141
10	1357	(CH ₂) ₂ (2-Cl-Ph)	H	H	6-Cl	2-CH ₃ -4-C ₂ F ₅	Paste
15	1358	(CH ₂) ₂ (3-Cl-Ph)	H	H	3-Cl	2-CH ₃ -4-C ₂ F ₅	117
20	1359	(CH ₂) ₂ (3-Cl-Ph)	H	H	6-Cl	2-CH ₃ -4-C ₂ F ₅	Paste
25	1360	(CH ₂) ₂ (4-Cl-Ph)	H	H	3-Cl	2-CH ₃ -4-C ₂ F ₅	118
30	1361	(CH ₂) ₂ (4-Cl-Ph)	H	H	6-Cl	2-CH ₃ -4-C ₂ F ₅	138
35	1362	CH(CH ₃)(2-Cl-Ph)	H	H	3-Cl	2-CH ₃ -4-C ₂ F ₅	Paste
40	1363	CH(CH ₃)(2-Cl-Ph)	H	H	6-Cl	2-CH ₃ -4-C ₂ F ₅	197
45	1364	CH(CH ₃)(3-Cl-Ph)	H	H	3-Cl	2-CH ₃ -4-C ₂ F ₅	100
50	1365	CH(CH ₃)(3-Cl-Ph)	H	H	6-Cl	2-CH ₃ -4-C ₂ F ₅	Crystals
	1366	CH(CH ₃)(4-Cl-Ph)	H	H	3-Cl	2-CH ₃ -4-C ₂ F ₅	195
	1367	CH(CH ₃)(4-Cl-Ph)	H	H	6-Cl	2-CH ₃ -4-C ₂ F ₅	Paste
	1368	(CH ₂) ₂ O(2-Cl-Ph)	H	H	3-Cl	2-CH ₃ -4-C ₂ F ₅	162
	1369	(CH ₂) ₂ O(2-Cl-Ph)	H	H	6-Cl	2-CH ₃ -4-C ₂ F ₅	160
	1370	(CH ₂) ₂ O(3-Cl-Ph)	H	H	3-Cl	2-CH ₃ -4-C ₂ F ₅	115
	1371	(CH ₂) ₂ O(3-Cl-Ph)	H	H	6-Cl	2-CH ₃ -4-C ₂ F ₅	172
	1372	(CH ₂) ₂ O(4-Cl-Ph)	H	H	3-Cl	2-CH ₃ -4-C ₂ F ₅	185
	1373	(CH ₂) ₂ O(4-Cl-Ph)	H	H	6-Cl	2-CH ₃ -4-C ₂ F ₅	148
	1374	(CH ₂) ₂ O-Ph	H	H	3-Cl	2-CH ₃ -4-C ₂ F ₅	154
	1375	(CH ₂) ₂ O-Ph	H	H	6-Cl	2-CH ₃ -4-C ₂ F ₅	183
	1376	(CH ₂) ₂ NH-Ph	H	H	3-Cl	2-CH ₃ -4-C ₂ F ₅	104
	1377	(CH ₂) ₂ NH-Ph	H	H	6-Cl	2-CH ₃ -4-C ₂ F ₅	Paste
	1378	CH(CH ₃)CH ₂ OH	H	H	6-Cl	2-CH ₃ -4-C ₂ F ₅	192

Table 1 (Cont'd)

	No	R ¹	R ²	R ³	Xn	Ym	Physical Properties (melting point: °C)
5	1379	CH(Ph)CH ₂ OH	H	H	H	2-CH ₃ -4-C ₂ F ₅	100-101
10	1380	CH(4-t-C ₄ H ₉ -Ph)-CH ₂ OH	H	H	H	2-CH ₃ -4-C ₂ F ₅	107-108
15	1381	C(CH ₃) ₂ CH ₂ OH	H	H	H	2-CH ₃ -4-C ₂ F ₅	227
20	1382	i-C ₃ H ₇	H	H	3-Cl	2-F-4-C ₂ F ₅	190
25	1383	i-C ₃ H ₇	H	H	3-Cl	2-Cl-4-C ₂ F ₅	180
30	1384	i-C ₃ H ₇	H	H	3-Cl	2-CF ₃ -4-C ₂ F ₅	235
35	1385	i-C ₃ H ₇	H	H	3-I	2-F-4-C ₂ F ₅	190
40	1386	i-C ₃ H ₇	H	H	3-I	2-Cl-4-C ₂ F ₅	200
45	1387	i-C ₃ H ₇	H	H	3-I	2-CF ₃ -4-C ₂ F ₅	255
50	1388	i-C ₃ H ₇	H	H	3-I	2-OCH ₃ -4-C ₂ F ₅	152
	1389	i-C ₃ H ₇	H	H	3-I	2-CH ₃ -4-CN	215
	1390	2-Fur	H	H	3-Cl	2-CH ₃ -4-C ₂ F ₅	178
	1391	2-Fur	H	H	6-Cl	2-CH ₃ -4-C ₂ F ₅	149
	1392	2-TetFur	H	H	3-Cl	2-CH ₃ -4-C ₂ F ₅	153
	1393	2-TetFur	H	H	6-Cl	2-CH ₃ -4-C ₂ F ₅	130
	1394	CH ₂ -4-Pyi	H	H	3-Cl	2-CH ₃ -4-C ₂ F ₅	88
	1395	CH ₂ -4-Pyi	H	H	6-Cl	2-CH ₃ -4-C ₂ F ₅	Paste
	1396	(CH ₂) ₃ OH	H	H	H	2-CH ₃ -4-C ₂ F ₅	83-84
	1397	(CH ₂) ₂ OH	H	H	H	2-CH ₃ -4-C ₂ F ₅	136
	1398	CH ₂ CH(OH)CH ₂ Ph	H	H	H	2-CH ₃ -4-C ₂ F ₅	77-78
	1399	(CH ₂) ₃ OH	H	H	3-Cl	2-CH ₃ -4-C ₂ F ₅	188
	1400	CH ₂ -Ph	H	H	3-I	2-CH ₃ -4-C ₂ F ₅	172

Table 1 (Cont'd)

	No	R ¹	R ²	R ³	Xn	Ym	Physical Properties (melting point: °C)
5	1401	CH ₂ -Ph	H	H	6-I	2-CH ₃ -4-C ₂ F ₅	212
10	1402	CH ₂ (2-Cl-Ph)	H	H	3-I	2-CH ₃ -4-C ₂ F ₅	136
15	1403	CH ₂ (2-Cl-Ph)	H	H	6-I	2-CH ₃ -4-C ₂ F ₅	214
20	1404	CH ₂ (2-CH ₃ -Ph)	H	H	3-I	2-CH ₃ -4-C ₂ F ₅	100
25	1405	CH ₂ (2-CH ₃ -Ph)	H	H	6-I	2-CH ₃ -4-C ₂ F ₅	185
30	1406	CH ₂ -Ph	CH ₃	H	3-Cl	2-CH ₃ -4-C ₂ F ₅	Paste
35	1407	CH ₂ -Ph	CH ₂ -Ph	H	3-Cl	2-CH ₃ -4-C ₂ F ₅	136
40	1408	CH ₂ -Ph	CH ₂ -Ph	H	6-Cl	2-CH ₃ -4-C ₂ F ₅	Paste
45	1409	i-C ₃ H ₇	H	H	3-I	2-C ₂ F ₅ -4-Br	250
50	1410	i-C ₃ H ₇	H	H	3-I	2-C ₂ F ₅ -4-C ₂ F ₅	245
	1411	CH ₂ C≡CH	H	H	H	2-CH ₃ -4-C ₂ F ₅	133-135
	1412	CH(4-Ph-Ph)CH ₂	H	H	3-Cl	2-CH ₃ -4-C ₂ F ₅	112
	1414	C(CH ₃) ₂ C≡CH	H	H	H	2-CH ₃ -4-C ₂ F ₅	207
	1415	C(CH ₃) ₂ CH ₂ OH	H	H	6-Cl	2-CH ₃ -4-C ₂ F ₅	231
	1416	CH(4-Cl-Ph)CH ₂	H	H	6-Cl	2-CH ₃ -4-C ₂ F ₅	225
	1417	C(CH ₃) ₂ -Ph	H	H	3-Cl	2-CH ₃ -4-C ₂ F ₅	190
	1418	C(CH ₃) ₂ CH ₂ -Ph	H	H	3-Cl	2-CH ₃ -4-C ₂ F ₅	192
	1419	CH ₂ -3-Pyi	H	H	3-Cl	2-CH ₃ -4-C ₂ F ₅	Paste
	1420	CH ₂ -3-Pyi	H	H	6-Cl	2-CH ₃ -4-C ₂ F ₅	Paste

Table 1 (Cont'd)

	No	R ¹	R ²	R ³	Xn	Ym	Physical Properties (melting point: °C)
10	1421	CH ₂ -Ph	H	H	3-Cl	2-CH ₃ -4-OCHF ₂	187
	1422	CH ₂ -Ph	H	H	6-Cl	2-CH ₃ -4-OCHF ₂	198
15	1423	CH ₂ -(2-Cl-Ph)	H	H	3-Cl	2-CH ₃ -4-OCHF ₂	178
	1424	CH ₂ -(2-Cl-Ph)	H	H	6-Cl	2-CH ₃ -4-OCHF ₂	192
	1425	CH ₂ -(2-CH ₃ -Ph)	H	H	3-Cl	2-CH ₃ -4-OCHF ₂	183
20	1426	CH ₂ -(2-CH ₃ -Ph)	H	H	6-Cl	2-CH ₃ -4-OCHF ₂	192
	1427	t-C ₄ H ₉	H	H	3-I	2-F-4-C ₂ F ₅	220
	1428	t-C ₄ H ₉	H	H	3-I	2-Cl-4-C ₂ F ₅	187
25	1429	t-C ₄ H ₉	H	H	3-I	2-CF ₃ -4-C ₂ F ₅	240
	1430	CH ₂ -Ph	H	H	3-I	2-CH ₃ -4-OCHF ₂	176
	1431	CH ₂ -Ph	H	H	6-I	2-CH ₃ -4-OCHF ₂	196
30	1432	CH ₂ -(2-Cl-Ph)	H	H	3-I	2-CH ₃ -4-OCHF ₂	189
	1433	CH ₂ -(2-Cl-Ph)	H	H	6-I	2-CH ₃ -4-OCHF ₂	227
	1434	CH ₂ -(2-CH ₃ -Ph)	H	H	3-I	2-CH ₃ -4-OCHF ₂	215
35	1435	CH ₂ -(2-CH ₃ -Ph)	H	H	6-I	2-CH ₃ -4-OCHF ₂	209
	1436	CH ₂ -Ph	CH ₃	H	6-Cl	2-CH ₃ -4-C ₂ F ₅	Paste
40	1437	CH ₂ -Ph	CH ₃	H	3-Cl	2-CH ₃ -4-OCHF ₂	Paste
	1438	CH ₂ -Ph	CH ₃	H	3-I	2-CH ₃ -4-C ₂ F ₅	175
	1439	CH ₂ -Ph	CH ₃	H	6-I	2-CH ₃ -4-C ₂ F ₅	Paste
45	1440	CH ₂ -Ph	CH ₃	H	3-I	2-CH ₃ -4-OCHF ₂	Paste
	1441	CH(C ₂ H ₅)CH ₂ OH	H	H	6-Cl	2-CH ₃ -4-C ₂ F ₅	213
50	1442	(R)-C*H(Ph)	H	H	3-Cl	2-CH ₃ -4-C ₂ F ₅	105-107
		-CH ₂ OH					

Table 1 (Cont'd)

No	R ¹	R ²	R ³	Xn	Ym	Physical Properties (melting point: °C)
1443	(R)-C*H(Ph) -CH ₂ OH	H	H	6-Cl	2-CH ₃ -4-C ₂ F ₅	145-146
1445	(S)-C*H(CH ₃) -CH ₂ OH	H	H	3-Cl	2-CH ₃ -4-C ₂ F ₅	93-95
1446	(S)-C*H(CH ₃) -CH ₂ OH	H	H	6-Cl	2-CH ₃ -4-C ₂ F ₅	93-95
1447	t-C ₄ H ₉	H	H	3-Cl	4-C ₂ F ₅	275
1448	t-C ₄ H ₉	H	H	3-Cl	2-F-4-C ₂ F ₅	225
1449	t-C ₄ H ₉	H	H	3-Cl	2-Cl-4-C ₂ F ₅	200
1450	n-C ₃ H ₇	H	H	3-I	2-CH ₃ -4-OCHF ₂	181
1451	n-C ₃ H ₇	H	H	6-I	2-CH ₃ -4-OCHF ₂	233
1452	c-C ₃ H ₅	H	H	3-I	2-CH ₃ -4-OCHF ₂	182
1453	c-C ₃ H ₅	H	H	6-I	2-CH ₃ -4-OCHF ₂	231
1454	s-C ₄ H ₉	H	H	3-I	2-CH ₃ -4-OCHF ₂	225
1455	s-C ₄ H ₉	H	H	6-I	2-CH ₃ -4-OCHF ₂	244
1456	CH ₂ C≡CH	H	H	3-I	2-CH ₃ -4-OCHF ₂	196
1457	CH ₂ -Ph	C ₂ H ₅	H	3-Cl	2-CH ₃ -4-C ₂ F ₅	Paste
1458	(R)-C*H(CH ₃) -Ph	H	H	3-Cl	2-CH ₃ -4-OCHF ₂	136
1459	(S)-C*H(CH ₃) -Ph	H	H	3-Cl	2-CH ₃ -4-OCHF ₂	136

Table 1 (Cont'd)

	No	R ¹	R ²	R ³	Xn	Ym	Physical Properties (melting point: °C)
5	1460	(R)-C*H(CH ₃) -CH ₂ OH	H	H	3-Cl	2-CH ₃ -4-C ₂ F ₅	94-95
10	1461	(R)-C*H(CH ₃) -CH ₂ OH	H	H	6-Cl	2-CH ₃ -4-C ₂ F ₅	94-95
15	1464	C(CH ₃) ₂ CH ₂ OH	H	H	3-I	2-CH ₃ -4-C ₂ F ₅	118
20	1465	CH(CH ₃)CH ₂ OH	H	H	6-I	2-CH ₃ -4-C ₂ F ₅	130-131
25	1466	C(CH ₃) ₂ C≡CH	H	H	3-Cl	2-CH ₃ -4-C ₂ F ₅	210-211
30	1467	C(CH ₃) ₂ C≡CH	H	H	6-Cl	2-CH ₃ -4-C ₂ F ₅	230
35	1468	CH ₂ (2-F-Ph)	H	H	3-Cl	2-CH ₃ -4-C ₂ F ₅	187
40	1469	CH ₂ (2-F-Ph)	H	H	6-Cl	2-CH ₃ -4-C ₂ F ₅	165
45	1470	CH ₂ -Ph	H	H	3-F	2-CH ₃ -4-C ₂ F ₅	158
50	1471	CH ₂ -Ph	H	H	6-F	2-CH ₃ -4-C ₂ F ₅	134
55	1472	s-C ₄ H ₉	H	H	3-I	2-F-4-C ₂ F ₅	200
60	1473	s-C ₄ H ₉	H	H	3-I	2-Cl-4-C ₂ F ₅	205
65	1474	i-C ₃ H ₇	H	H	3-I	2-F-4-n-C ₃ F ₇	165
70	1475	t-C ₄ H ₉	H	H	3-I	2-C ₂ H ₅ -4-C ₂ F ₅	235
75	1476	CH ₂ CH(OH)Ph	H	H	3-Cl	2-CH ₃ -4-C ₂ F ₅	108
80	1477	CH ₂ CH(OH)Ph	H	H	6-Cl	2-CH ₃ -4-C ₂ F ₅	105
85	1478	C(CH ₃) ₂ C≡CH	H	H	3-Cl	2-CH ₃ -4-C ₂ F ₅	105

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Table 1 (Cont'd)

	No	R ¹	R ²	R ³	Xn	Yn	Physical Properties (melting point: °C)
5	1479	C(CH ₃) ₂ C≡C -2-Thi	H	H	3-Cl	2-CH ₃ -4-C ₂ F ₅	110
10	1480	C(CH ₃) ₂ C≡C-Ph	H	H	6-Cl	2-CH ₃ -4-C ₂ F ₅	194
15	1481	(R)-C*H(CH ₃) -CH ₂ OH	H	H	3-I	2-CH ₃ -4-C ₂ F ₅	103-105
20	1482	(S)-C*H(CH ₃) -CH ₂ OH	H	H	3-I	2-CH ₃ -4-C ₂ F ₅	103-105
25	1483	(R)-C*H(CH ₃) -CH ₂ OH	H	H	6-I	2-CH ₃ -4-C ₂ F ₅	173-174
30	1484	C(CH ₃) ₂ (4-Cl -Ph)	H	H	3-Cl	2-CH ₃ -4-C ₂ F ₅	218
35	1485	C(CH ₃) ₂ (3-Cl -Ph)	H	H	3-Cl	2-CH ₃ -4-C ₂ F ₅	128
40	1486	CH ₂ -Ph	H	H	3-Cl	2-F-4-C ₂ F ₅	162
45	1487	CH ₂ -Ph	H	H	3-Cl	2-Cl-4-C ₂ F ₅	153
50	1488	C ₂ H ₅	H	H	3-Cl	2-F-4-C ₂ F ₅	135
	1489	C ₂ H ₅	H	H	3-Cl	2-Cl-4-C ₂ F ₅	125
	1490	C ₂ H ₅	H	H	3-Cl	2-F-4-n-C ₃ F ₇	128
	1491	n-C ₃ H ₇	H	H	3-Cl	2-F-4-C ₂ F ₅	153
	1492	n-C ₃ H ₇	H	H	3-Cl	2-Cl-4-C ₂ F ₅	147
	1493	n-C ₃ H ₇	H	H	3-Cl	2-F-4-n-C ₃ F ₇	142
	1494	i-C ₃ H ₇	H	H	3-Cl	2-F-4-n-C ₃ F ₇	142
	1495	i-C ₃ H ₇	H	H	3-Cl	2-C ₂ H ₅ -4-C ₂ F ₅	213

Table 1 (Cont'd)

	No	R ¹	R ²	R ³	Xn	Ym	Physical Properties (melting point: °C)
10	1496	t-C ₄ H ₉	H	H	3-Cl	2-F-4-n-C ₃ F ₇	172
	1497	t-C ₄ H ₉	H	H	3-Cl	2-C ₂ H ₅ -4-C ₂ F ₅	194
15	1498	s-C ₄ H ₉	H	H	3-Cl	2-F-4-C ₂ F ₅	209
	1499	s-C ₄ H ₉	H	H	3-Cl	2-Cl-4-C ₂ F ₅	194
	1500	s-C ₄ H ₉	H	H	3-Cl	2-F-4-n-C ₃ F ₇	182
20	1501	s-C ₄ H ₉	H	H	3-Cl	2-C ₂ H ₅ -4-C ₂ F ₅	212
	1502	C ₂ H ₅	H	H	3-I	2-F-4-C ₂ F ₅	135
25	1503	C ₂ H ₅	H	H	3-I	2-Cl-4-C ₂ F ₅	155
	1504	t-C ₄ H ₉	H	H	3-I	2-F-4-n-C ₃ F ₇	180
	1505	t-C ₄ H ₉	H	H	3-F	2-CH ₃ -4-C ₂ F ₅	220
30	1506	t-C ₄ H ₉	H	H	3-F	2-CH ₃ -4-OCHF ₂	186
	1507	t-C ₄ H ₉	H	H	3-F	2-F-4-C ₂ F ₅	214
	1508	t-C ₄ H ₉	H	H	3-F	2-Cl-4-C ₂ F ₅	222
35	1509	t-C ₄ H ₉	H	H	3-F	2-F-4-n-C ₃ F ₇	179
	1510	C ₂ H ₅	H	H	3-F	2-F-4-C ₂ F ₅	125
	1511	C ₂ H ₅	H	H	6-F	2-F-4-C ₂ F ₅	155
40	1512	n-C ₃ H ₇	H	H	3-F	2-F-4-C ₂ F ₅	130
	1513	n-C ₃ H ₇	H	H	6-F	2-F-4-C ₂ F ₅	170
45	1514	i-C ₃ H ₇	H	H	3-F	2-F-4-C ₂ F ₅	190
	1515	i-C ₃ H ₇	H	H	6-F	2-F-4-C ₂ F ₅	180
	1516	i-C ₃ H ₇	H	H	3-F	2-Cl-4-C ₂ F ₅	210
50	1517	i-C ₃ H ₇	H	H	6-F	2-Cl-4-C ₂ F ₅	160

Table 1 (Cont'd)

	No	R ¹	R ²	R ³	Xn	Ym	Physical Properties (melting point: °C)
10	1518	(S)-C*H(CH ₃) -CH ₂ OH	H	H	6-I	2-CH ₃ -4-C ₂ F ₅	173-174
15	1519	C(CH ₃) ₂ CH ₂ OH	H	H	3-I	2-CH ₃ -4-OCF ₃	205
20	1520	C(CH ₃) ₂ CH ₂ OH	H	H	6-I	2-CH ₃ -4-OCF ₃	248
25	1521	i-C ₃ H ₇	H	H	3-I	2-CH ₃ -4-(4-CF ₃ O -Ph)	247-250
30	1522	i-C ₃ H ₇	H	H	3-I	2-CH ₃ -4-(4-CF ₃ -Ph)	243-246
35	1523	CH ₂ (2-CF ₃ -Ph)	H	H	3-Cl	2-CH ₃ -4-C ₂ F ₅	183
40	1524	n-C ₃ H ₇	H	H	3-I	2-F-4-n-C ₃ F ₇	145
45	1525	C ₂ H ₅	C ₂ H ₅	H	3-F	2-CH ₃ -4-C ₂ F ₅	135
50	1526	C ₂ H ₅	C ₂ H ₅	H	3-F	2-CH ₃ -4-i-C ₃ F ₇	150
	1527	C ₂ H ₅	C ₂ H ₅	H	3-F	2-CH ₃ -4-OCF ₃	125
	1528	C ₂ H ₅	C ₂ H ₅	H	3-F	2-CH ₃ -4-OCHF ₂	110
	1529	C ₂ H ₅	C ₂ H ₅	H	3-F	2-CH ₃ -4-OCF ₂ CHF ₂	155
	1530	C ₂ H ₅	C ₂ H ₅	H	3-F	2-F-4-C ₂ F ₅	130
	1531	C ₂ H ₅	C ₂ H ₅	H	3-F	2-Cl-4-C ₂ F ₅	110
	1532	C ₂ H ₅	C ₂ H ₅	H	3-I	2-CH ₃ -4-i-C ₃ F ₇	142
	1533	C ₂ H ₅	C ₂ H ₅	H	3-I	2-CH ₃ -4-OCF ₃	142
	1534	C ₂ H ₅	C ₂ H ₅	H	3-I	4-OCF ₃	142
	1535	C ₂ H ₅	C ₂ H ₅	H	3-Cl	2-CH ₃ -4-C ₂ F ₅	150
	1536	C ₂ H ₅	C ₂ H ₅	H	3-Cl	2-CH ₃ -4-OCF ₃	123
	1537	C ₂ H ₅	C ₂ H ₅	H	3-Cl	2-CH ₃ -4-i-C ₃ F ₇	147

Table 1 (Cont'd)

	No	R ¹	R ²	R ³	Xn	Ym	Physical Properties (melting point: °C)
10	1538	C ₂ H ₅	C ₂ H ₅	H	3-Cl	2-CH ₃ -4-OCHF ₂	92
	1539	C ₂ H ₅	C ₂ H ₅	H	3-Cl	2-CH ₃ -4-OCF ₂ CHF ₂	135
15	1540	C ₂ H ₅	C ₂ H ₅	H	3-Cl	2-Cl-4-C ₂ F ₅	110
	1541	C ₂ H ₅	C ₂ H ₅	H	3-Cl	2-F-4-C ₂ F ₅	113
20	1542	C ₂ H ₅	C ₂ H ₅	H	3-Cl	2-CH ₃ -Cl	142
	1543	C ₂ H ₅	C ₂ H ₅	H	3-Cl	2-C ₂ H ₅ -4-C ₂ F ₅	101
25	1544	C ₂ H ₅	C ₂ H ₅	H	3-Cl	4-OCF ₃	138
	1545	C ₂ H ₅	C ₂ H ₅	H	3-Cl	4-CF ₃	188
30	1546	C ₂ H ₅	C ₂ H ₅	H	3-F	2-CH ₃ -4-Cl	135
	1547	C ₂ H ₅	C ₂ H ₅	H	3-F	4-CF ₃	175
35	1548	C ₂ H ₅	C ₂ H ₅	H	3-F	4-OCF ₃	155
	1549	C ₂ H ₅	C ₂ H ₅	H	3-F	2-C ₂ H ₅ -4-C ₂ F ₅	80
40	1550	C ₂ H ₅	C ₂ H ₅	H	3-NO ₂	2-CH ₃ -4-C ₂ F ₅	185
	1551	C ₂ H ₅	C ₂ H ₅	H	6-NO ₂	2-CH ₃ -4-C ₂ F ₅	145
45	1552	t-C ₄ H ₉	H	H	3-I	3-CH ₃ -4-C ₂ F ₅	215
	1553	CH ₂ -Ph	CH ₃	CH ₃	3-Cl	2-CH ₃ -4-C ₂ F ₅	Paste
50	1554	CH(CH ₃)-Ph	H	CH ₃	3-Cl	2-CH ₃ -4-C ₂ F ₅	Paste
	1555	C ₂ H ₅	C ₂ H ₅	H	3-I	2-CH ₃ -4-OCHF ₂	138-139
55	1556	C ₂ H ₅	C ₂ H ₅	H	3-I	2-CH ₃ -4-OCF ₂ CHF ₂	136
	1557	C ₂ H ₅	C ₂ H ₅	H	3-I	2-CH ₃ -4-Cl	179
60	1558	C ₂ H ₅	C ₂ H ₅	H	3-I	4-CF ₃	187
	1559	C ₂ H ₅	C ₂ H ₅	H	3-I	2-C ₂ H ₅ -4-C ₂ F ₅	106
65	1560	C ₂ H ₅	C ₂ H ₅	H	3-I	2-Cl-4-C ₂ F ₅	103-105

Table 1 (Cont'd)

	No	R ¹	R ²	R ³	Xn	Ym	Physical Properties (melting point: °C)
10	1561	C ₂ H ₅	C ₂ H ₅	H	3-I	2-CH ₃ -4-C ₂ F ₅	115
	1562	t-C ₄ H ₉	H	H	3-I	2-Br-4-C ₂ F ₅	185
15	1563	i-C ₃ H ₇	H	H	3-I	3-CH ₃ -4-C ₂ F ₅	240
	1564	i-C ₃ H ₇	H	H	H	4-O-(2-Pym)	246
20	1565	C(CH ₃) ₂ -CH ₂ CH ₃	H	H	3-I	2-CH ₃ -4-C ₂ F ₅	193
	1566	C(CH ₃) ₂ -CH ₂ CH ₃	H	H	3-I	2-CH ₃ -4-OCF ₃	180
	1567	C(CH ₃) ₂ CH ₂ CH ₃	H	H	3-I		178-179
25	1568	C(CH ₃) ₂ CH ₂ CH ₃	H	H	3-I	2-CH ₃ -4-OCHF ₂	176-177
	1569	C(CH ₃) ₂ CH=CH ₂	H	H	3-Cl	2-CH ₃ -4-C ₂ F ₅	223-224
30	1570	C(CH ₃) ₂ CH≡C -(4-CH ₃ -Ph)	H	H	3-Cl	2-CH ₃ -4-C ₂ F ₅	92-93
	1571	C(CH ₃) ₂ CH≡C -(2,4-Cl ₂ -Ph)	H	H	3-Cl	2-CH ₃ -4-C ₂ F ₅	96-97
35	1572	C(CH ₃) ₂ CH≡C -(4-CH ₃ O-Ph)	H	H	3-Cl	2-CH ₃ -4-C ₂ F ₅	88-89
	1573	n-C ₃ H ₇	C ₂ H ₅	H	3-I	2-CH ₃ -4-C ₂ F ₅	93
40	1574	n-C ₃ H ₇	C ₂ H ₅	H	3-I	2-CH ₃ -4-OCF ₃	109
	1575	n-C ₃ H ₇	C ₂ H ₅	H	3-I	2-CH ₃ -4-OCHF ₂	102
45	1576	CH ₂ (4-CF ₃ O-Ph)	H	H	3-Cl	2-CH ₃ -4-C ₂ F ₅	172
	1577	CH ₂ (4-CF ₃ O-Ph)	H	H	6-Cl	2-CH ₃ -4-C ₂ F ₅	193
50	1578	CH ₂ (3-Cl-Ph)	CH ₃	H	3-Cl	2-CH ₃ -4-C ₂ F ₅	Paste
	1579	CH ₂ (2-F-Ph)	CH ₃	H	3-Cl	2-CH ₃ -4-C ₂ F ₅	115
	1580	i-C ₃ H ₇	H	H	3-I	2-Br-4-C ₂ F ₅	190

Table 1 (Cont'd)

	No	R ¹	R ²	R ³	Xn	Ym	Physical Properties (melting point: °C)
5	1581	n-C ₃ H ₇	C ₂ H ₅	H	3-F	2-CH ₃ -4-C ₂ F ₅	120
10	1582	n-C ₃ H ₇	C ₂ H ₅	H	3-F	4-OCF ₃	115
15	1583	n-C ₃ H ₇	C ₂ H ₅	H	3-F	4-OCHF ₂	85
20	1584	n-C ₃ H ₇	C ₂ H ₅	H	3-F	2-Cl-4-C ₂ F ₅	75
25	1585	C(CH ₃) ₂ CH≡C -(4-CF ₃ -Ph)	H	H	3-Cl	2-CH ₃ -4-C ₂ F ₅	102-103
30	1586	C(CH ₃) ₂ CH≡C -(2,6-Cl ₂ -Ph)	H	H	3-Cl	2-CH ₃ -4-C ₂ F ₅	115-117
35	1587	C(CH ₃) ₂ CH≡C -2-Pyi	H	H	3-Cl	2-CH ₃ -4-C ₂ F ₅	169
40	1588	C(CH ₃) ₂ CH≡CH	H	H	3-Cl	2-CH ₃ -4-OCHF ₂	191-192
45	1589	C(CH ₃) ₂ CH=CH ₂	H	H	6-Cl	2-CH ₃ -4-C ₂ F ₅	242
50	1590	C(CH ₃) ₂ CH≡C -3-Pyi	H	H	3-Cl	2-CH ₃ -4-C ₂ F ₅	134-135
55	1591	i-C ₃ H ₇	H	H	H	2-CH ₃ -4-(2,6 -(CH ₃ O) ₂ -Ph)	165
60	1592	i-C ₃ H ₇	H	H	H	2-CH ₃ -4-(3,5 -(CH ₃ O) ₂ -Ph)	150
65	1593	C ₂ H ₅	C ₂ H ₅	H	H	2-CH ₃ -4-(3,5 -(CH ₃ O) ₂ -Ph)	Paste
70	1594	i-C ₃ H ₇	H	H	3-Cl	2-F-4-(OCF ₂ O)-5	195
75	1595	i-C ₃ H ₇	H	H	3-I	2-F-4-(OCF ₂ O)-5	208
80	1596	t-C ₄ H ₉	H	H	3-I	2-F-4-(OCF ₂ O)-5	202

Table 1 (Cont'd)

	No	R ¹	R ²	R ³	Xn	Ym	Physical Properties (melting point: °C)
5	1597	i-C ₃ H ₇	H	H	3-Cl	2-CH ₃ -4-(OCHFCF ₂ -O)-5	211
10	1598	i-C ₃ H ₇	H	H	3-I	2-CH ₃ -4-(OCHFCF ₂ -O)-5	212
15	1599	t-C ₄ H ₉	H	H	3-I	2-CH ₃ -4-(OCHFCF ₂ -O)-5	217
20	1600	i-C ₃ H ₇	H	H	3-I	2-Cl-4-(OCHFCF ₂ -O)-5	210
25	1601	i-C ₃ H ₇	H	H	3-I	2-Cl-4-(OCF ₂ CHF-O)-5	214
30	1602	C(CH ₃) ₂ C≡CH	H	H	3-Cl	2-CH ₃ -4-OCF ₃	178-180
35	1603	C(CH ₃) ₂ CHBr -CH ₂ Br	H	H	3-Cl	2-CH ₃ -4-C ₂ F ₅	130-131
40	1604	C(CH ₃) ₂ CH=CH -Ph(E)	H	H	3-Cl	2-CH ₃ -4-C ₂ F ₅	90-93
45	1605	C(CH ₃) ₂ CH ₂ Br	H	H	3-I	2-CH ₃ -4-OCF ₃	139-141
50	1606	(S)-C*H -(CH ₃)-CH ₂ Br	H	H	3-I	2-CH ₃ -4-C ₂ F ₅	105-107
	1607	(R)-C*H -(CH ₃)-CH ₂ Br	H	H	3-I	2-CH ₃ -4-C ₂ F ₅	105-107
	1608	i-C ₃ H ₇	H	H	3-I	3-Cl-4-C ₂ F ₅	145
	1609	t-C ₄ H ₉	H	H	3-I	3-Cl-4-C ₂ F ₅	260

Table 1 (Cont'd)

	No	R ¹	R ²	R ³	Xn	Ym	Physical Properties (melting point: °C)
10	1610	i-C ₃ H ₇	H	H	3-I	2-CH ₃ -4-C ₂ F ₅ -5-CH ₃	210
	1611	t-C ₄ H ₉	H	H	3-I	2-CH ₃ -4-C ₂ F ₅ -5-CH ₃	215
15	1612	i-C ₃ H ₇	H	H	3-I	2,3-(CH ₃) ₂ -4-C ₂ F ₅	210
	1613	t-C ₄ H ₉	H	H	3-I	2,3-(CH ₃) ₂ -4-C ₂ F ₅	220
20	1614	C ₂ H ₅	C ₂ H ₅	H	3-I	2-CH ₃ -4-(4-F-Ph)	130-133
	1615	C ₂ H ₅	C ₂ H ₅	H	3-I	2-CH ₃ -4-(4-Cl-Ph)	173-175
25	1616	i-C ₃ H ₇	H	H	H	2-CH ₃ -4-O-(2-Thz)	149
	1617	i-C ₃ H ₇	H	H	3-I	Mixture of 2-CH ₃ -4-(4-(2-CH ₃ -Thz)) and 2-CH ₃ -5-(4-(2-CH ₃ -Thz)) (1:1)	235
30	1618	i-C ₃ H ₇	H	H	3-I	2-CH ₃ -4-O-(2-Pym)	239
	1619	C ₂ H ₅	C ₂ H ₅	H	3-I	2-CH ₃ -4-(4-CF ₃ -Ph)	112-115
35	1620	i-C ₃ H ₇	H	H	3-I	4-CF ₂ CF ₂ O-5	239
	1621	i-C ₃ H ₇	H	H	3-Cl	4-CF ₂ CF ₂ O-5	243
40	1622	i-C ₃ H ₇	H	H	3-I	2-Cl-4-OCF ₂ O-5	226
	1623	i-C ₃ H ₇	H	H	3-Cl	2-Cl-4-OCF ₂ O-5	223
45	1624	t-C ₄ H ₉	H	H	3-I	2-Cl-4-OCF ₂ O-5	221
	1625	i-C ₃ H ₇	H	H	3-I	2-Cl-4-OCF ₂ CF ₂ O	241
50	1626	i-C ₃ H ₇	H	H	3-I	2-Cl-3-OCF ₂ CF ₂ O-4	219
	1627	C(CH ₃) ₂ CH ₂ Cl	H	H	3-I	2-CH ₃ -4-OCF ₃	160
	1628	C(CH ₃) ₂ C≡C	H	H	3-Cl	2-CH ₃ -4-C ₂ F ₅	78-80
		-3-Thi					

Table 1 (Cont'd)

No	R ¹	R ²	R ³	Xn	Ym	Physical Properties (melting point: °C)
1629	C(CH ₃) ₂ C≡CH	H	H	3-I	2-CH ₃ -4-C ₂ F ₅	187-188
1630	i-C ₃ H ₇	H	H	3-I	2-CH ₃ -4-(3,5-(CH ₃ O) ₂ -Ph)	199
1631	i-C ₃ H ₇	H	H	H	3-OCH ₂ O-4	195
1632	i-C ₃ H ₇	H	H	H	2-F-4-Cl	177
1633	C(CH ₃) ₂ C≡C-(4-CF ₃ O-Ph)	H	H	3-Cl	2-CH ₃ -4-C ₂ F ₅	92-93
1634	C(CH ₃) ₂ C≡CH	H	H	3-I	2-CH ₃ -4-OCF ₃	188-189
1635	C(CH ₃) ₂ C≡CH	H	H	3-I	2-CH ₃ -4-OCHF ₂	175-176
1636	i-C ₃ H ₇	H	H	3-I	4-N=(n-C ₃ F ₇)C-0-5	182
1637	i-C ₃ H ₇	H	H	3-I	4-O-C(n-C ₃ F ₇)=N-5	250
1638	i-C ₃ H ₇	H	H	3-Cl	4-O-C(n-C ₃ F ₇)=N-5	168
1639	t-C ₄ H ₉	H	H	3-I	4-O-C(n-C ₃ F ₇)=N-5	248
1640	i-C ₃ H ₇	H	H	3-I	2,3-(CH ₃) ₂ -4-C ₂ F ₅	195
1641	i-C ₃ H ₇	H	H	3-I	2-CH ₃ -4-OC(CF ₃)=N-5	229
1642	i-C ₃ H ₇	H	H	3-Cl	2-Cl-3-OCF ₂ CF ₂ O-4	188
1643	i-C ₃ H ₇	H	H	3-Cl	2-Cl-4-OCF ₂ CF ₂ O-5	203
1644	t-C ₄ H ₉	H	H	3-I	2-Cl-3-OCF ₂ CF ₂ O-4	189
1645	t-C ₄ H ₉	H	H	3-I	2-Cl-4-OCF ₂ CF ₂ O-5	234
1646	C(CH ₃) ₂ CH ₂ Cl	H	H	3-I	2-CH ₃ -4-C ₂ F ₅	168-169
1647	C(CH ₃) ₂ CH ₂ Br	H	H	3-I	2-CH ₃ -4-C ₂ F ₅	167-168
1648	C(CH ₃) ₂ C≡C-Naph	H	H	3-I	2-CH ₃ -4-C ₂ F ₅	90

Table 1 (Cont'd)

No	R ¹	R ²	R ³	Xn	Ym	Physical Properties (melting point: °C)
1649	C(CH ₃) ₂ C≡C-(5-Br-2-Pyi)	H	H	3-Cl	2-CH ₃ -4-C ₂ F ₅	105-106
1650	C(CH ₃) ₂ C≡C-(2,4-F ₂ -Ph)	H	H	3-Cl	2-CH ₃ -4-C ₂ F ₅	103-105
1651	(S)-C*H(CH ₃)-CH ₂ F	H	H	3-Cl	2-CH ₃ -4-C ₂ F ₅	135
1652	(S)-C*H-(CH ₃)-CH ₂ Br	H	H	3-Cl	2-CH ₃ -4-C ₂ F ₅	193-198
1653	i-C ₃ H ₇	H	H	3-I	2-CH ₃ -4-C ₂ F ₅ -5-Cl	210
1654	t-C ₄ H ₉	H	H	3-I	2-CH ₃ -4-C ₂ F ₅ -5-Cl	200
1655	i-C ₃ H ₇	H	H	3-I	2-CH ₃ -4-C ₂ F ₅ -5-CH ₃	190
1656	t-C ₄ H ₉	H	H	3-I	2-CH ₃ -4-C ₂ F ₅ -5-CH ₃	195
1657	i-C ₃ H ₇	H	H	H	3-(2-CH ₃ -4-Thz)	211
1658	i-C ₃ H ₇	H	H	3-I	3-(2-CF ₃ -4-Thz)	122
1659	i-C ₃ H ₇	H	H	3-I	3-(2-CH ₃ -4-Oxa)	102
1660	i-C ₃ H ₇	H	H	3-I	2-I-4-OCF ₂ O-5	252
1661	i-C ₃ H ₇	H	H	3-Cl	2-CH ₃ -4-OCF ₂ O-5	218
1662	t-C ₄ H ₉	H	H	3-I	2-CH ₃ O-4-C ₂ F ₅	135

Table 1 (Cont'd)

No	R ¹	R ²	R ³	Xn	Ym	Physical Properties (melting point: °C)
1663	i-C ₃ H ₇	H	H	3-I	2-CH ₃ -4-i-C ₃ F ₇ -5-F	235
1664	t-C ₄ H ₉	H	H	3-I	2-CH ₃ -4-i-C ₃ F ₇ -5-F	230
1665	i-C ₃ H ₇	H	H	3-I	2-CH ₃ -4-i-C ₃ F ₇ -5-Cl	210
1666	i-C ₃ H ₇	H	H	3-I	2-CH ₃ -4-CF ₂ CF ₂ O-5	198
1667	i-C ₃ H ₇	H	H	3-I	2-CH ₃ -4-i-C ₃ F ₇	270
1668	t-C ₄ H ₉	H	H	3-I	2-CH ₃ -4-i-C ₃ F ₇	290
1669	i-C ₃ H ₇	H	H	3-I	2-F-4-i-C ₃ F ₇	205
1670	t-C ₄ H ₉	H	H	3-I	2-F-4-i-C ₃ F ₇	210
1671	i-C ₃ H ₇	H	H	3-I	2-SCH ₃ -4-i-C ₃ F ₇	205
1672	t-C ₄ H ₉	H	H	3-I	2-SCH ₃ -4-i-C ₃ F ₇	205
1673	i-C ₃ H ₇	H	H	3-I	2,4-(CH ₃) ₂ -4-i-C ₃ F ₇	240
1674	t-C ₄ H ₉	H	H	3-I	2,4-(CH ₃) ₂ -4-i-C ₃ F ₇	245
1675	i-C ₃ H ₇	H	H	3-I	4-(2-CH ₃ -4-Thz)	217
1676	i-C ₃ H ₇	H	H	3-I	4-(2-CH ₃ -4-Oxa)	212
1677	i-C ₃ H ₇	H	H	3-I	4-(2-i-C ₃ H ₇ -4-Thz)	199
1678	i-C ₃ H ₇	H	H	3-NO ₂	4-(2-CH ₃ -4-Thz)	230
1679	i-C ₃ H ₇	H	H	3-I	2-Cl-3-OCF ₂ CHFO-4	188
1680	i-C ₃ H ₇	H	H	3-I	2-Cl-3-OCHFCF ₂ O-4	191
1681	i-C ₃ H ₇	H	H	3-I	Mixture of 2-Cl-3-OCHFCF ₂ O-4-5-Cl and 2-Cl-3-OCHFCF ₂ O-4-6-Cl (1:1)	199

Table 1 (Cont'd)

	No	R ¹	R ²	R ³	Xn	Ym	Physical Properties (melting point: °C)
10	1682	i-C ₃ H ₇	H	H	3-I	2-Cl-3-N=C(CF ₃)-O-4	265
	1683	t-C ₄ H ₉	H	H	3-I	2-Cl-3-N=C(CF ₃)-O-4	259
15	1684	i-C ₃ H ₇	H	H	3-I	2-Br-4-OCF ₂ CHFO-5	185
	1685	i-C ₃ H ₇	H	H	3-I	Mixture of 2,3-Br ₂ -4-OCF ₂ CHFO-5; 2,5-Br ₂ -3-OCHFCF ₂ O-4; and 2,6-Br ₂ -3-OCF ₂ CHFO-4(1:1:1)	250
20	1686	i-C ₃ H ₇	H	H	3-I	Mixture of 2,3-Br ₂ -4-OCF ₂ CHFO-5; 2,5-Br ₂ -3-OCHFCF ₂ O-4; and 2,6-Br ₂ -3-OCF ₂ CHFO-4(1:1:1)	228
25	1689	i-C ₃ H ₇	H	H	3-I	2,3-(CH ₃) ₂ -4-i-C ₃ F ₇	270
	1690	t-C ₄ H ₉	H	H	3-I	2,3-(CH ₃) ₂ -4-i-C ₃ F ₇	280
30	1691	i-C ₃ H ₇	H	H	3-I	2-i-C ₃ H ₇ -4-i-C ₃ F ₇	240
	1692	t-C ₄ H ₉	H	H	3-I	2-i-C ₃ H ₇ -4-i-C ₃ F ₇	245
35	1693	i-C ₃ H ₇	H	H	3-I	2-OC ₂ H ₅ -4-i-C ₃ F ₇	195
	1694	t-C ₄ H ₉	H	H	3-I	2-OC ₂ H ₅ -4-i-C ₃ F ₇	210
40	1695	i-C ₃ H ₇	H	H	3-I	3-F-4-i-C ₃ F ₇	265
	1696	t-C ₄ H ₉	H	H	3-I	3-F-4-i-C ₃ F ₇	285
45	1697	i-C ₃ H ₇	H	H	3-I	3-Cl-4-i-C ₃ F ₇	295
	1698	i-C ₃ H ₇	H	H	3-I	2-Br-4-i-C ₃ F ₇ -5-CH ₃	240
50	1699	i-C ₃ H ₇	H	H	3-I	2-Br-4-i-C ₃ F ₇	240
	1700	i-C ₃ H ₇	H	H	3-I	2-SCH ₃ -4-C ₂ F ₅	200
	1703	i-C ₃ H ₇	H	H	3-I	4-(2-c-C ₃ H ₅ -4-Thz)	198

Table 1 (Cont'd)

	No	R ¹	R ²	R ³	Xn	Ym	Physical Properties (melting point: °C)
5	1714	i-C ₃ H ₇	H	H	3-I	2-C ₂ H ₅ -4-i-C ₃ F ₇	220
10	1715	i-C ₃ H ₇	H	H	3-I	2-OCH ₃ -4-i-C ₃ F ₇	190
15	1716	i-C ₃ H ₇	H	H	3-I	2,6(CH ₃) ₂ -4-i-C ₃ F ₇	275
20	1717	i-C ₃ H ₇	H	H	3-I	2,6-(CH ₃) ₂ -4-C ₂ F ₅	250
25	1722	i-C ₃ H ₇	H	H	3-I	2-Cl-4-i-C ₃ F ₇	220
30	1723	t-C ₄ H ₉	H	H	3-I	2-Cl-4-i-C ₃ F ₇	210
35	1726	i-C ₃ H ₇	H	H	3-I	2-(CH ₂) ₄ -3-4-i-C ₃ F ₇	260
40	1727	t-C ₄ H ₉	H	H	3-I	2-(CH ₂) ₄ -3-4-i-C ₃ F ₇	272
45	1732	i-C ₃ H ₇	H	H	3-I	2-Cl-3-OCF ₂ CF ₂ O-4	245
50	1733	i-C ₃ H ₇	H	H	3-I	2-Cl-3-OCHFCF ₂ O-4	190
	1737	i-C ₃ H ₇	H	H	3-I	4-C(CH ₃)=NOCH ₃	190
	1742	i-C ₃ H ₇	H	H	3-I	2-OCF ₂ O-3	190
	1743	i-C ₃ H ₇	H	H	3-I	2-OCF ₂ O-3-6-Cl	213
	1744	i-C ₃ H ₇	H	H	3-I	2-OCF ₂ O-3-4-Cl	202
	1745	i-C ₃ H ₇	H	H	3-I	2-OCF ₂ O-3-4,6-Cl ₂	228
	1746	i-C ₃ H ₇	H	H	3-I	2-OCF ₂ O-3-4-i-C ₃ F ₇	175
	1747	t-C ₄ H ₉	H	H	3-I	2-OCF ₂ O-3-4-Cl	235
	1748	t-C ₄ H ₉	H	H	3-I	2-OCF ₂ O-3-4,6-Cl ₂	243
	1749	i-C ₃ H ₇	H	H	3-I	4-C(CH ₃)=NOCH ₂ -Ph	205
	1750	i-C ₃ H ₇	H	H	3-I	4-C(CH ₃)=NOCH ₂ -CH=CH ₂	Decomp.

Table 1 (Cont'd)

No	R ¹	R ²	R ³	Xn	Ym	Physical Properties (melting point: °C)
1751	CH ₃	CH ₃	H	H	2-CH ₃ -4-Cl	149
1752	C ₂ H ₅	C ₂ H ₅	H	H	2-CH ₃ -4-Cl	172
1753	n-C ₃ H ₇	n-C ₃ H ₇	H	H	2-CH ₃ -4-Cl	126
1762	i-C ₃ H ₇	H	H	3-I	3-C(i-C ₃ F ₇)=NN -(i-C ₃ F ₇)-4	Paste
1763	i-C ₃ H ₇	H	H	3-I	4-i-C ₃ H ₇ -2-N=CH-S-3	200
1764	i-C ₃ H ₇	H	H	3-I	3-S-C(i-C ₃ H ₇)=N-4	218
1765	i-C ₃ H ₇	H	H	3-I	4-(2-CF ₃ -4-Thz)	105
1766	i-C ₃ H ₇	H	H	3-I	3-SCH ₃ -4-i-C ₃ F ₇	160
1767	i-C ₃ H ₇	H	H	3-I	2-Ph-4-i-C ₃ F ₇	240
1768	i-C ₃ H ₇	H	H	3-I	2-OPh-4-i-C ₃ F ₇	180
1769	i-C ₃ H ₇	H	H	3-I	2-OCH ₃ -4-i-C ₃ F ₇	265
1770	(CH ₂) ₂ -3-Pyi	H	H	3-I	2-CH ₃ -4-i-C ₃ F ₇	Amorphous
1771	(CH ₂) ₂ -3-Pyi	H	H	6-I	2-CH ₃ -4-i-C ₃ F ₇	Amorphous
1772	(CH ₂) ₂ -3-Pyi	H	H	3-I	2-CH ₃ -4-OCF ₃	169-173
1773	CH(CH ₃)-2-Pyi	H	H	3-I	2-CH ₃ -4-i-C ₃ F ₇	Amorphous
1774	CH(CH ₃)-2-Pyi	H	H	6-I	2-CH ₃ -4-i-C ₃ F ₇	Amorphous
1775	CH(CH ₃)-2-Pyi	H	H	3-I	2-CH ₃ -4-OCF ₃	158-161
1776	CH(CH ₃)-2-Pyi	H	H	6-I	2-CH ₃ -4-OCF ₃	213-216
1777	CH(CH ₃)-2-Pyi	H	H	3-I	2-CH ₃ -4-C ₂ F ₅	149-152
1778	CH(CH ₃)-2-Pyi	H	H	6-I	2-CH ₃ -4-C ₂ F ₅	194-196

Table 1 (Cont'd)

No	R ¹	R ²	R ³	Xn	Ym	Physical Properties (melting point: °C)
1780	N(Ph)COCF ₃	H	H	3-I	2-CH ₃ -4-C ₂ F ₅	239-241
1799	CH(CH ₃)-2-Fur	H	H	3-I	2-CH ₃ -4-i-C ₃ F ₇	191
1800	CH(CH ₃)-2-Thi	H	H	3-I	2-CH ₃ -4-i-C ₃ F ₇	159
1801	i-C ₃ H ₇	H	H	3-CF ₃	2-CH ₃ -4-C ₂ F ₅	210-212
1802	i-C ₃ H ₇	H	H	3-Cl-6-CF ₃ S	2-CH ₃ -4-C ₂ F ₅	236-237
1803	i-C ₃ H ₇	H	H	3-CF ₃ SO	2-CH ₃ -4-C ₂ F ₅	186-187
1804	i-C ₃ H ₇	H	H	6-CF ₃ SO	2-CH ₃ -4-C ₂ F ₅	206-208
1805	i-C ₃ H ₇	H	H	3-CF ₃ SO	2-CH ₃ -4-i-C ₃ F ₇	211-213
1815	i-C ₃ H ₇	H	H	3-I	2-CH ₃ -4-s-C ₄ F ₉	190
1816	i-C ₃ H ₇	H	H	3-I	2-OH-4-i-C ₃ F ₇	155
1824	i-C ₃ H ₇	H	H	3-I	2-N=C(CF ₃)O-3 -4-i-C ₃ F ₇	132
1825	i-C ₃ H ₇	H	H	3-I	2-N=C(CF ₃)O-3	145
1826	t-C ₄ H ₉	H	H	3-I	2-N=C(CF ₃)O-3 -4-i-C ₃ F ₇	110
1827	t-C ₄ H ₉	H	H	3-I	2-N=C(CF ₃)O-3	120
1829	(CH ₂) ₂ NH-CO ₂ C ₂ H ₅	H	H	3-I	2-CH ₃ -4-i-C ₃ F ₇	155
1830	(CH ₂) ₂ NHCO ₂ CH ₂ Ph	H	H	3-I	2-CH ₃ -4-C ₂ F ₅	155
1831	(CH ₂) ₂ CH=CF ₂	H	H	3-I	2-CH ₃ -4-C ₂ F ₅	180

Table 1 (Cont'd)

	No	R ¹	R ²	R ³	Xn	Ym	Physical Properties (melting point: °C)
10	1838	i-C ₃ H ₇	H	H	H	2-CH ₃ -4-OCF ₂ CF ₃	
	1839	i-C ₃ H ₇	H	H	3-NO ₂	2-CH ₃ -4-OCF ₂ CF ₃	
15	1840	i-C ₃ H ₇	H	H	3-F	2-CH ₃ -4-OCF ₂ CF ₃	
	1841	i-C ₃ H ₇	H	H	3-Cl	2-CH ₃ -4-OCF ₂ CF ₃	
20	1842	i-C ₃ H ₇	H	H	3-Br	2-CH ₃ -4-OCF ₂ CF ₃	
	1843	i-C ₃ H ₇	H	H	3-Cl-4-F	2-CH ₃ -4-OCF ₂ CF ₃	
25	1844	i-C ₃ H ₇	H	H	3,4-Cl ₂	2-CH ₃ -4-OCF ₂ CF ₃	
	1845	i-C ₃ H ₇	H	H	3-I	4-OCF ₂ CF ₃	
30	1846	i-C ₃ H ₇	H	H	3-I	2-Cl-4-OCF ₂ CF ₃	
	1847	i-C ₃ H ₇	H	H	3-I	2-CH ₃ -4-OCF ₂ CF ₃	
35	1848	t-C ₄ H ₉	H	H	3-I	2-CH ₃ -4-OCF ₂ CF ₃	
	1849	C ₂ H ₅	C ₂ H ₅	H	3-I	2-CH ₃ -4-OCF ₂ CF ₃	
40	1850	i-C ₃ H ₇	H	H	3-I	2-C ₂ H ₅ -4-OCF ₂ CF ₃	
	1851	i-C ₃ H ₇	H	H	H	2-CH ₃ -4-O-n-C ₃ F ₇	
45	1852	i-C ₃ H ₇	H	H	3-NO ₂	2-CH ₃ -4-O-n-C ₃ F ₇	
	1853	i-C ₃ H ₇	H	H	3-F	2-CH ₃ -4-O-n-C ₃ F ₇	
50	1854	i-C ₃ H ₇	H	H	3-Cl	2-CH ₃ -4-O-n-C ₃ F ₇	
	1855	i-C ₃ H ₇	H	H	3-Br	2-CH ₃ -4-O-n-C ₃ F ₇	
55	1856	t-C ₄ H ₉	H	H	3-Cl-4-F	2-CH ₃ -4-O-n-C ₃ F ₇	
	1857	C ₂ H ₅	C ₂ H ₅	H	3,4-Cl ₂	2-CH ₃ -4-O-n-C ₃ F ₇	
60	1858	i-C ₃ H ₇	H	H	3-I	4-O-n-C ₃ F ₇	
	1859	i-C ₃ H ₇	H	H	3-I	2-Cl-4-O-n-C ₃ F ₇	
65	1860	i-C ₃ H ₇	H	H	3-I	2-CH ₃ -4-O-n-C ₃ F ₇	

Table 1 (Cont'd)

	No	R ¹	R ²	R ³	Xn	Ym	Physical Properties (melting point: °C)
5	1861	t-C ₄ H ₉	H	H	3-I	2-CH ₃ -4-O-n-C ₃ F ₇	
10	1862	C ₂ H ₅	C ₂ H ₅	H	3-I	2-CH ₃ -4-O-n-C ₃ F ₇	
15	1863	i-C ₃ H ₇	H	H	3-I	2-C ₂ H ₅ -4-OCF ₂ CF ₃	
20	1864	i-C ₃ H ₇	H	H	3-I	2-CH ₃ -4-C≡C-t-C ₄ F ₉	
25	1865	i-C ₃ H ₇	H	H	3-I	2-CH ₃ -4-C≡C-CF ₃	
30	1866	i-C ₃ H ₇	H	H	3-I	2-CH ₃ -4-C≡C-i-C ₃ F ₇	
35	1867	i-C ₃ H ₇	H	H	3-I	2-CH ₃ -4-CF=CF ₂	
40	1868	i-C ₃ H ₇	H	H	3-I	2-CH ₃ -4-CF=CFCF ₃	
45	1869	i-C ₃ H ₇	H	H	3-I	2-CH ₃ -4-C(CF ₃)=CF ₂	
50	1870	i-C ₃ H ₇	H	H	3-I	2-CH ₃ -4-COCH ₃	195
	1871	i-C ₃ H ₇	H	H	3-I	2-CH ₃ -4-COCF ₃	
	1872	i-C ₃ H ₇	H	H	3-I	2-CH ₃ -4-COC ₂ F ₅	
	1873	i-C ₃ H ₇	H	H	3-I	2-CH ₃ -4-COCF(CH ₃) ₂	
	1874	i-C ₃ H ₇	H	H	3-I	2-CH ₃ -4-COOCH ₃	217
	1875	i-C ₃ H ₇	H	H	3-I	2-CH ₃ -4-COOC ₂ H ₅	
	1876	i-C ₃ H ₇	H	H	3-I	2-CH ₃ -4-C(CH ₃)=NOCH ₃	218
	1877	i-C ₃ H ₇	H	H	3-I	2-CH ₃ -4-C(CH ₃)=NOC ₂ H ₅	
	1878	i-C ₃ H ₇	H	H	3-I	2-CH ₃ -4-C(CH ₃)=NO -CH ₂ CH=CH ₂	
	1879	i-C ₃ H ₇	H	H	3-I	2-CH ₃ -4-C(CH ₃)=NO -CH ₂ C≡CH	
	1880	i-C ₃ H ₇	H	H	3-I	2-CH ₃ -4-C(CH ₃)=NOCH ₂ -Ph	
	1881	i-C ₃ H ₇	H	H	3-I	2-CH ₃ -4-CH ₂ OH	

Table 1 (Cont'd)

	No	R ¹	R ²	R ³	Xn	Ym	Physical Properties (melting point: °C)
10	1882	i-C ₃ H ₇	H	H	3-I	4-CH(OH)CH ₃	
	1883	i-C ₃ H ₇	H	H	3-I	2-CH ₃ -4-CH(OH)CH ₃	
15	1884	i-C ₃ H ₇	H	H	3-I	2-CH ₃ -4-CH ₂ ON=C(CH ₃) ₂	
	1885	i-C ₃ H ₇	H	H	3-I	2-CH ₃ -4-CH ₂ ON=C(Ph) -i-C ₃ H ₇	
20	1886	i-C ₃ H ₇	H	H	3-I	2-OCH ₂ O-3-4-i-C ₃ F ₇	
	1887	i-C ₃ H ₇	H	H	3-I	2-OCH ₂ CH ₂ O-3-4-i-C ₃ F ₇	
25	1888	i-C ₃ H ₇	H	H	3-I	2-OCF ₂ CF ₂ O-3-4-i-C ₃ F ₇	
	1889	i-C ₃ H ₇	H	H	3-I	2-OCF ₂ CHFO-3-4-i-C ₃ F ₇	
30	1890	i-C ₃ H ₇	H	H	3-I	2-OCHFCF ₂ O-3-4-i-C ₃ F ₇	
	1891	i-C ₃ H ₇	H	H	3-I	2-SCH ₂ S-3-4-i-C ₃ F ₇	
35	1892	i-C ₃ H ₇	H	H	3-I	2-SCF ₂ S-3-4-i-C ₃ F ₇	
	1893	i-C ₃ H ₇	H	H	3-I	2-SCH ₂ CH ₂ S-3-4-i-C ₃ F ₇	
40	1894	i-C ₃ H ₇	H	H	3-I	2-SCF ₂ CF ₂ S-3-4-i-C ₃ F ₇	
	1895	i-C ₃ H ₇	H	H	3-I	2-CH ₂ OCH ₂ -3-4-i-C ₃ F ₇	
45	1896	i-C ₃ H ₇	H	H	3-I	2-CH ₂ SCH ₂ -3-4-i-C ₃ F ₇	
	1897	i-C ₃ H ₇	H	H	3-I	2-CF ₂ OCF ₂ -3-4-i-C ₃ F ₇	
50	1898	i-C ₃ H ₇	H	H	3-I	2-CF ₂ SCF ₂ -3-4-i-C ₃ F ₇	
	1899	i-C ₃ H ₇	H	H	3-Br	2-CH ₃ -4-i-C ₃ F ₇	
55	1900	i-C ₃ H ₇	H	H	3-Br -4-Cl	2-CH ₃ -4-i-C ₃ F ₇	
	1901	i-C ₃ H ₇	H	H	3-I-4-F	2-CH ₃ -4-i-C ₃ F ₇	
	1902	i-C ₃ H ₇	H	H	3-I-4-Cl	2-CH ₃ -4-i-C ₃ F ₇	

Table 1 (Cont'd)

	No	R ¹	R ²	R ³	Xn	Yn	Physical Properties (melting point: °C)
5	1903	i-C ₃ H ₇	H	H	3-I-4-CF ₃	2-CH ₃ -4-i-C ₃ F ₇	
10	1904	i-C ₃ H ₇	H	H	3-I-4-OCH ₃	2-CH ₃ -4-i-C ₃ F ₇	
15	1905	i-C ₃ H ₇	H	H	3-I-4-Br	2-CH ₃ -4-i-C ₃ F ₇	
20	1906	i-C ₃ H ₇	H	H	3-Cl-4-CF ₃	2-CH ₃ -4-i-C ₃ F ₇	
25	1907	i-C ₃ H ₇	H	H	3-CF ₃ -4-Cl	2-CH ₃ -4-i-C ₃ F ₇	
30	1908	i-C ₃ H ₇	H	H	3-CF ₃ -4-F	2-CH ₃ -4-i-C ₃ F ₇	
35	1919	i-C ₃ H ₇	H	H	3-CF ₃ -4-OCH ₃	2-CH ₃ -4-i-C ₃ F ₇	
40	1910	i-C ₃ H ₇	H	H	3-N=CH-CH=CH-4	2-CH ₃ -4-i-C ₃ F ₇	
45	1911	i-C ₃ H ₇	H	H	3-OCH ₂ O-4	2-CH ₃ -4-i-C ₃ F ₇	
50	1912	i-C ₃ H ₇	H	H	3-OCH ₂ O-4	2-CH ₃ -4-C ₂ F ₆	
	1913	i-C ₃ H ₇	H	H	3-OCH ₂ O-4	2-CH ₃ -4-OCF ₃	
	1914	i-C ₃ H ₇	H	H	3-OCF ₂ O-4	2-CH ₃ -4-i-C ₃ F ₇	
	1915	i-C ₃ H ₇	H	H	3-OCF ₂ O-4	2-CH ₃ -4-C ₂ F ₆	
	1916	i-C ₃ H ₇	H	H	3-OCF ₂ O-4	2-CH ₃ -4-OCF ₃	
	1917	i-C ₃ H ₇	H	H	3-OCH ₂ CH ₂ O-4	2-CH ₃ -4-i-C ₃ F ₇	
	1918	i-C ₃ H ₇	H	H	3-OCF ₂ CF ₂ O-4	2-CH ₃ -4-i-C ₃ F ₇	
	1919	i-C ₃ H ₇	H	H	3-OCHFCF ₂ O-4	2-CH ₃ -4-i-C ₃ F ₇	
	1920	i-C ₃ H ₇	H	H	3-OCF ₂ CHFO-4	2-CH ₃ -4-i-C ₃ F ₇	
	1921	i-C ₃ H ₇	H	H	3-OCH ₂ CH ₂ -4	2-CH ₃ -4-i-C ₃ F ₇	
	1922	i-C ₃ H ₇	H	H	3-CH ₂ CH ₂ O-4	2-CH ₃ -4-i-C ₃ F ₇	
	1923	i-C ₃ H ₇	H	H	3-OCF ₂ CF ₂ -4	2-CH ₃ -4-i-C ₃ F ₇	
	1924	i-C ₃ H ₇	H	H	3-CF ₂ CF ₂ O-4	2-CH ₃ -4-i-C ₃ F ₇	
	1925	i-C ₃ H ₇	H	H	3-SOCH ₃	2-CH ₃ -4-i-C ₃ F ₇	

Table 1 (Cont'd)

	No	R ¹	R ²	R ³	Xn	Ym	Physical Properties (melting point: °C)
5	1926	i-C ₃ H ₇	H	H	3-SO ₂ CH ₃	2-CH ₃ -4-i-C ₃ F ₇	
10	1927	i-C ₃ H ₇	H	H	3-CF ₃ S	2-CH ₃ -4-i-C ₃ F ₇	222-223
15	1928	i-C ₃ H ₇	H	H	6-CF ₃ S	2-CH ₃ -4-i-C ₃ F ₇	219-221
20	1929	t-C ₄ H ₉	H	H	3-CF ₃ S	2-CH ₃ -4-i-C ₃ F ₇	231
25	1930	t-C ₄ H ₉	H	H	6-CF ₃ S	2-CH ₃ -4-i-C ₃ F ₇	245-247
30	1931	t-C ₄ H ₉	H	H	3-CF ₃ SO ₂	2-CH ₃ -4-i-C ₃ F ₇	
35	1932	t-C ₄ H ₉	H	H	3-CF ₃ SO ₂	2-CH ₃ -4-C ₂ F ₅	
40	1933	t-C ₄ H ₉	H	H	3-CF ₃ SO ₂	2-CH ₃ -4-OCF ₃	
45	1934	C ₂ H ₅	C ₂ H ₅	H	3-CF ₃ SO ₂	2-CH ₃ -4-i-C ₃ F ₇	
50	1935	C ₂ H ₅	C ₂ H ₅	H	3-CONHCH ₃	2-CH ₃ -4-i-C ₃ F ₇	
	1936	C ₂ H ₅	C ₂ H ₅	H	3-CON(CH ₃) ₂	2-CH ₃ -4-i-C ₃ F ₇	
	1937	C ₂ H ₅	C ₂ H ₅	H	3-COOCH ₃	2-CH ₃ -4-i-C ₃ F ₇	
	1938	C ₂ H ₅	C ₂ H ₅	H	3-COC ₂ H ₅	2-CH ₃ -4-i-C ₃ F ₇	
	1939	C ₂ H ₅	C ₂ H ₅	H	3-C(CH ₃)=NOCH ₃	2-CH ₃ -4-i-C ₃ F ₇	
	1940	C ₂ H ₅	C ₂ H ₅	H	3-C(CH ₃)=NO -C ₂ H ₅	2-CH ₃ -4-i-C ₃ F ₇	
	1941	i-C ₃ H ₇	H	H	3-C≡CH	2-CH ₃ -4-C ₂ F ₅	
	1942	i-C ₃ H ₇	H	H	3-C≡CH	2-CH ₃ -4-i-C ₃ F ₇	
	1943	i-C ₃ H ₇	H	H	3-C≡C-t-C ₄ H ₉	2-CH ₃ -4-C ₂ F ₅	195-202
	1944	i-C ₃ H ₇	H	H	3-C≡C-t-C ₄ H ₉	2-CH ₃ -4-i-C ₃ F ₇	
	1945	i-C ₃ H ₇	H	H	3-C≡C-Ph	2-CH ₃ -4-C ₂ F ₅	179-183
	1946	i-C ₃ H ₇	H	H	3-C≡C-Ph	2-CH ₃ -4-i-C ₃ F ₇	

Table 1 (Cont'd)

	No	R ¹	R ²	R ³	Xn	Ym	Physical Properties (melting point: °C)
5	1947	i-C ₃ H ₇	H	H	3-C≡C -CF ₃	2-CH ₃ -4-C ₂ F ₅	
10	1948	i-C ₃ H ₇	H	H	3-C≡C -CF ₃	2-CH ₃ -4-i-C ₃ F ₇	
15	1949	i-C ₃ H ₇	H	H	3-C ₂ F ₅	2-CH ₃ -4-C ₂ F ₅	
20	1950	t-C ₄ H ₉	H	H	3-C ₂ F ₅	2-CH ₃ -4-C ₂ F ₅	
25	1951	C ₂ H ₅	C ₂ H ₅	H	3-C ₂ F ₅	2-CH ₃ -4-C ₂ F ₅	
30	1952	i-C ₃ H ₇	H	H	3-C ₂ F ₅	2-CH ₃ -4-i-C ₃ F ₇	
35	1953	t-C ₄ H ₉	H	H	3-C ₂ F ₅	2-CH ₃ -4-i-C ₃ F ₇	
40	1954	C ₂ H ₅	C ₂ H ₅	H	3-C ₂ F ₅	2-CH ₃ -4-i-C ₃ F ₇	
45	1955	i-C ₃ H ₇	SN -(n-C ₄ H ₉) ₂	H	3-I	2-CH ₃ -4-i-C ₃ F ₇	
50	1956	i-C ₃ H ₇	SO ₂ CH ₃	H	3-I	2-CH ₃ -4-i-C ₃ F ₇	
	1957	i-C ₃ H ₇	CN	H	3-I	2-CH ₃ -4-i-C ₃ F ₇	
	1958	i-C ₃ H ₇	COOCH ₃	H	3-I	2-CH ₃ -4-i-C ₃ F ₇	
	1959	i-C ₃ H ₇	COOC ₂ H ₅	H	3-I	2-CH ₃ -4-i-C ₃ F ₇	
	1960	i-C ₃ H ₇	COCH ₃	H	3-I	2-CH ₃ -4-i-C ₃ F ₇	
	1961	i-C ₃ H ₇	COC ₂ H ₅	H	3-I	2-CH ₃ -4-i-C ₃ F ₇	
	1962	i-C ₃ H ₇	CO-Ph	H	3-I	2-CH ₃ -4-i-C ₃ F ₇	
	1963	i-C ₃ H ₇	NHCOCH ₃	H	3-I	2-CH ₃ -4-i-C ₃ F ₇	

Table 1 (Cont'd)

	No	R ¹	R ²	R ³	Xn	Y _n	Physical Properties (melting point: °C)
5	1964	C ₂ H ₅	C ₂ H ₅	SN(n-C ₄ H ₉) ₂	3-I	2-CH ₃ -4-i-C ₃ F ₇	
10	1965	C ₂ H ₅	C ₂ H ₅	SO ₂ CH ₃	3-I	2-CH ₃ -4-i-C ₃ F ₇	
15	1966	C ₂ H ₅	C ₂ H ₅	CN	3-I	2-CH ₃ -4-i-C ₃ F ₇	
20	1967	C ₂ H ₅	C ₂ H ₅	COOCH ₃	3-I	2-CH ₃ -4-i-C ₃ F ₇	
25	1968	C ₂ H ₅	C ₂ H ₅	COOC ₂ H ₅	3-I	2-CH ₃ -4-i-C ₃ F ₇	
30	1969	C ₂ H ₅	C ₂ H ₅	COCH ₃	3-I	2-CH ₃ -4-i-C ₃ F ₇	
35	1970	C ₂ H ₅	C ₂ H ₅	COOC ₂ H ₅	3-I	2-CH ₃ -4-i-C ₃ F ₇	Amorphous
40	1971	C ₂ H ₅	C ₂ H ₅	COPh	3-I	2-CH ₃ -4-i-C ₃ F ₇	
45	1972	C ₂ H ₅	C ₂ H ₅	NHCOCH ₃	3-I	2-CH ₃ -4-i-C ₃ F ₇	
50	1973	(CH ₂) ₂ COO -CH ₃	H	H	3-I	2-CH ₃ -4-i-C ₃ F ₇	
	1974	(CH ₂) ₂ COO -CH ₃	H	H	3-I	2-CH ₃ -4-C ₂ F ₅	
	1975	(CH ₂) ₂ COO -C ₂ H ₅	H	H	3-I	2-CH ₃ -4-i-C ₃ F ₇	133.2
	1976	(CH ₂) ₂ COO -C ₂ H ₅	H	H	3-I	2-CH ₃ -4-C ₂ F ₅	
	1977	(CH ₂) ₂ COO -C ₂ H ₅	H	H	6-I	2-CH ₃ -4-C ₂ F ₅	163.5
	1978	CH(CH ₃)CH ₂ -COOCH ₃	H	H	3-I	2-CH ₃ -4-i-C ₃ F ₇	

Table 1 (Cont'd)

No	R ¹	R ²	R ³	Xn	Ym	Physical Properties (melting point: °C)
1979	CH(CH ₃)CH ₂ COOC ₂ H ₅	H	H	3-I	2-CH ₃ -4-i-C ₃ F ₇	
1980	CH(CH ₃)CH ₂ COO-i-C ₃ H ₇	H	H	3-I	2-CH ₃ -4-i-C ₃ F ₇	
1981	(CH ₂) ₂ CONHCH ₃	H	H	3-I	2-CH ₃ -4-i-C ₃ F ₇	
1982	(CH ₂) ₂ CONHC ₂ H ₅	H	H	3-I	2-CH ₃ -4-i-C ₃ F ₇	
1983	CH(CH ₃)CH ₂ CONHCH ₃	H	H	3-I	2-CH ₃ -4-i-C ₃ F ₇	
1984	CH(CH ₃)CH ₂ CONHC ₂ H ₅	H	H	3-I	2-CH ₃ -4-i-C ₃ F ₇	
1985	CH(CH ₃)CH ₂ CONH-i-C ₃ H ₇	H	H	3-I	2-CH ₃ -4-i-C ₃ F ₇	
1986	CH(CH ₃)CH ₂ CON-(CH ₃) ₂	H	H	3-I	2-CH ₃ -4-i-C ₃ F ₇	
1987	CH(CH ₃)CH ₂ CON-(C ₂ H ₅) ₂	H	H	3-I	2-CH ₃ -4-i-C ₃ F ₇	
1988	(CH ₂) ₂ NHCOOCH ₃	H	H	3-I	2-CH ₃ -4-C ₂ F ₅	
1989	(CH ₂) ₂ NHCOOCH ₃	H	H	3-I	2-CH ₃ -4-i-C ₃ F ₇	
1990	(CH ₂) ₂ NHCOOC ₂ H ₅	H	H	3-I	2-CH ₃ -4-C ₂ F ₅	145
1991	(CH ₂) ₂ NHCOOC ₂ H ₅	H	H	3-I	2-CH ₃ -4-OCF ₃	210
1992	CH(CH ₃)CH ₂ NHCOOCH ₃	H	H	3-I	2-CH ₃ -4-i-C ₃ F ₇	
1993	CH(CH ₃)CH ₂ NHCOO-C ₂ H ₅	H	H	3-I	2-CH ₃ -4-i-C ₃ F ₇	
1994	(CH ₂) ₂ P(CH ₃) ₂	H	H	3-I	2-CH ₃ -4-i-C ₃ F ₇	
1995	CH(CH ₃)P(C ₂ H ₅) ₂	H	H	3-I	2-CH ₃ -4-i-C ₃ F ₇	

Table 1 (Cont'd)

	No	R ¹	R ²	R ³	Xn	Yn	Physical Properties (melting point: °C)
5	1996	(CH ₂) ₂ P(Ph) ₂	H	H	3-I	2-CH ₃ -4-i-C ₃ F ₇	
10	1997	CH(CH ₃)CH ₂ P(CH ₃) ₂	H	H	3-I	2-CH ₃ -4-i-C ₃ F ₇	
15	1998	CH(CH ₃)CH ₂ P(C ₂ H ₅) ₂	H	H	3-I	2-CH ₃ -4-i-C ₃ F ₇	
20	1999	CH(CH ₃)CH ₂ P(Ph) ₂	H	H	3-I	2-CH ₃ -4-i-C ₃ F ₇	
25	2000	CH(CH ₃)(CH ₂) ₂ P -(CH ₃) ₂	H	H	3-I	2-CH ₃ -4-i-C ₃ F ₇	
30	2001	CH(CH ₃)(CH ₂) ₃ P -(CH ₃) ₂	H	H	3-I	2-CH ₃ -4-i-C ₃ F ₇	
35	2002	(CH ₂) ₂ PO(CH ₃) ₂	H	H	3-I	2-CH ₃ -4-i-C ₃ F ₇	
40	2003	(CH ₂) ₂ PO(OC ₂ H ₅) ₂	H	H	3-I	2-CH ₃ -4-i-C ₃ F ₇	Amorphous
45	2004	CH(CH ₃)CH ₂ PO(OCH ₃) ₂	H	H	3-I	2-CH ₃ -4-i-C ₃ F ₇	
50	2005	(CH ₂) ₂ OPO(OCH ₃) ₂	H	H	3-I	2-CH ₃ -4-i-C ₃ F ₇	
	2006	CH(CH ₃)CH ₂ PS(OCH ₃) ₂	H	H	3-I	2-CH ₃ -4-i-C ₃ F ₇	
	2007	CH(CH ₃)CH ₂ PS -(OC ₂ H ₅) ₂	H	H	3-I	2-CH ₃ -4-i-C ₃ F ₇	
	2008	(CH ₂) ₂ OPO(OC ₂ H ₅) ₂	H	H	3-I	2-CH ₃ -4-i-C ₃ F ₇	
	2009	CH(CH ₃)CH ₂ OPO -(OCH ₃) ₂	H	H	3-I	2-CH ₃ -4-i-C ₃ F ₇	
	2010	CH(CH ₃)CH ₂ OPO -(OC ₂ H ₅) ₂	H	H	3-I	2-CH ₃ -4-i-C ₃ F ₇	
	2011	(CH ₂) ₂ OPS(OCH ₃) ₂	H	H	3-I	2-CH ₃ -4-i-C ₃ F ₇	
	2012	(CH ₂) ₂ OPS(OC ₂ H ₅) ₂	H	H	3-I	2-CH ₃ -4-i-C ₃ F ₇	

Table 1 (Cont'd)

No	R ¹	R ²	R ³	Xn	Ym	Physical Properties (melting point: °C)
2013	CH(CH ₃)CH ₂ OPS -(OCH ₃) ₂	H	H	3-I	2-CH ₃ -4-i-C ₃ F ₇	
2014	CH(CH ₃)CH ₂ OPS -(OC ₂ H ₅) ₂	H	H	3-I	2-CH ₃ -4-i-C ₃ F ₇	
2015	CH(CH ₃)-2-Pyi-N -oxide	H	H	3-I	2-CH ₃ -4-C ₂ F ₅	198-205
2016	CH(CH ₃)-2-Pyi-N -oxide	H	H	3-I	2-CH ₃ -4-i-C ₃ F ₇	208-210
2017	i-C ₃ H ₇	H	H	3-I	2-CH ₃ -4-C(CF ₃) =NOCH ₃	
2018	i-C ₃ H ₇	H	H	3-I	2-CH ₃ -4-C(CF ₃) =NOCH ₂ Ph	
2019	i-C ₃ H ₇	H	H	3-I	2-NCHCHCHCH-3 -4-i-C ₃ F ₇	180
2020	i-C ₃ H ₇	H	H	3-I	2-n-C ₃ H ₇ -4-i -C ₃ F ₇	225
2021	i-C ₃ H ₇	H	H	3-I	2-O-(2-Pyi)-4 -i-C ₃ F ₇	158.3-159.8

[0083] The abbreviations in Table 1 stand for the following substituents:

Ph : phenyl group,
 c- : alicyclic hydrocarbon group,
 Pyi : pyridyl group,
 Pym : pyrimidinyl group,
 Fur : furyl group,
 TetFur : tetrahydrofuryl group,
 Thi : thiienyl group,
 Thz : thiazolyl group.

Naph : naphthyl group,
 Oxa : oxazolyl group,
 C* : asymmetric carbon atom

5

Table 2

	No	R ¹	R ²	R ³	Xn	Ym	Z ¹	Z ²	Physical Properties (melting point: °C)
10	S-1	i-C ₃ H ₇	H	H	3-Cl	2-CH ₃ -4-CF ₂ CF ₃	S	O	162-164
	S-2	t-C ₄ H ₉	H	H	3-Cl	2-CH ₃ -4-CF ₂ CF ₃	S	O	141-143
	S-3	c-C ₃ H ₅	H	H	3-Cl	2-CH ₃ -4-CF ₂ CF ₃	S	O	138-139
15	S-4	C ₂ H ₅	C ₂ H ₅	H	3-Cl	2-CH ₃ -4-CF ₂ CF ₃	S	O	184-186
	S-5	i-C ₃ H ₇	H	H	H	2-CH ₃ -4-Cl	S	O	168-170
	S-6	i-C ₃ H ₇	H	H	H	2-CH ₃ -4-Cl	O	S	
20	S-7	i-C ₃ H ₇	H	H	3-I	2-CH ₃ -4-i-C ₃ H ₇	O	S	
	S-8	i-C ₃ H ₇	H	H	H	2-CH ₃ -4-i-C ₃ H ₇	S	S	
	S-9	i-C ₃ H ₇	H	H	3-I	2-CH ₃ -4-i-C ₃ H ₇	S	S	

[0084] The ¹H-NMR data of the compounds obtained as paste (physical properties) are given in Table 3 below.

25

Table 3

No.	¹ H-NMR[CDCl ₃ /TMS, δ values (ppm)]
1122	1.2-1.4(m.6H), 2.4-2.5(m.3H), 3.1-3.9(m.7H), 6.6-7.9(m.6H)
1218	1.3(d.3H), 2.3(s.3H), 2.9-3.2(m.2H), 4.4(m.1H), 6.2(d.1H), 7.1-7.5(m.3H), 7.8(d.1H), 8.0(d.1H), 8.4(d.1H), 8.5(s.1H).

35 [0085] Agricultural and horticultural insecticides containing the phthalic acid diamide derivative of the general formula (I) of the present invention as an active ingredient are suitable for controlling various insect pests such as agricultural insect pests, forest insect pests, horticultural insect pests, stored grain insect pests, sanitary insect pests, nematodes, etc., which are injurious to paddy rice, fruit trees, vegetables, other crops, flowers and ornamental plants, etc. They have a marked insecticidal effect, for example, on LEPIDOPTERA including summer fruit tortrix (Adoxophyes orana fasciata), smaller tea tortrix (Adoxophyes sp.), Manchurian fruit moth (Grapholita inopinata), oriental fruit moth (Grapholita molesta), soybean pod borer (Leguminivora glycinivorella), mulberry leafroller (Olethreutes mori), tea leafroller (Caloptilia thevivora), Caloptilia sp. (Caloptilia zachrysa), apple leafminer (Phyllonorycter ringoniella), pear barkminer (Spulerrina astaura), common white (Piers rapae crucivora), tobacco budworm (Heliothis sp.), codling moth (Laspeyresia pomonella), diamondback moth (Plutella xylostella), apple fruit moth (Argyresthia conjugella), peach fruit moth (Carposina nipponensis), rice stem borer (Chilo suppressalis), rice leafroller (Cnaphalocrocis medinalis), tobacco moth (Ephestia elutella), mulberry pyralid (Glyphodes pyralalis), yellow rice borer (Scirpophaga incertulas), rice skipper (Paranara guttata), rice armyworm (Pseudaletia separata), pink borer (Sesamia inferens), common cutworm (Spodoptera litura), beet armyworm (Spodoptera exigua), etc.; HEMIPTERA including aster leafhopper (Macrosteles fascifrons), green rice leafhopper (Nephrotettix cincticeps), brown rice planthopper (Nilaparvata lugens), whitebacked rice planthopper (Sogatella furcifera), citrus psylla (Diaphorina citri), grape whitefly (Aleurolobus taonabae), sweetpotato whitefly (Bemisia tabaci), greenhouse whitefly (Trialeurodes vaporariorum), turnip aphid (Lipaphis erysimi), green peach aphid (Myzus persicae), Indian wax scale (Ceroplastes ceriferus), cottony citrus scale (Pulvinaria aurantii), camphor scale (Pseudaonidia duplex), San Jose scale (Comstockaspis perniciosa), arrowhead scale (Unaspis yanonensis), etc.; COLEOPTERA including soybean beetle (Angomala rufocuprea), Japanese beetle (Popillia japonica), tobacco beetle (Lasioderma serricorne), powderpost beetle (Lycus brunneus), twenty-eight spotted ladybird (Epilachna vigintioctopunctata), adzuki bean weevil (Callosobruchus chinensis), vegetable weevil (Listroderes costirostris), maize weevil (Sitophilus zeamais), boll weevil (Anthonomus gradis gradis), rice water weevil (Lissorhoptrus oryzophilus), cucurbit leaf beetle (Aulacophora femoralis), rice leaf beetle (Oulema oryzae), striped flea beetle (Phylloreta striolata), pine

shoot beetle (Tomicus piniperda), Colorado potato beetle (Leptinotarsa decemlineata), Mexican bean beetle (Epilachna varivestis), corn rootworm (Diabrotica sp.), etc.; DIPTERA including melon fly (Dacus(Zeugodacus) cucurbitae), oriental fruit fly (Dacus(Bactrocera) dorsalis), rice leafminer (Agnomyza oryzae), onion maggot (Delia antiqua), seedcorn maggot (Delia platura), soybean pod gall midge (Asphondylia sp.), muscid fly (Musca domestica), house mosquito (Culex pipiens pipiens), etc.; and TYLENCHIDA including root-lesion nematode (Pratylenchus sp.), coffee root-lesion nematode (Pratylenchus coffeeae), potato cyst nematode (Globodera rostochiensis), root-knot nematode (Meloidogyne sp.), citrus nematode (Tylenchulus semipenetrans), Aphelenchus sp. (Aphelenchus avenae), chrysanthemum foliar (Aphelenchoides ritzemabosi), etc.

[0086] The agricultural and horticultural insecticide containing the phthalic acid diamide derivative of the general formula (I) of the present invention as an active ingredient has a marked insecticidal effect on the above-exemplified insect pests, sanitary insect pests, and/or nematodes, which are injurious to paddy field crops, upland crops, fruit trees, vegetables, other crops, flowers and ornament plants, and the like. Therefore, the desired effect of the agricultural and horticultural insecticide of the present invention can be obtained by applying the insecticide to the paddy field water, stalks and leaves of fruit trees, vegetables, other crops, flowers and ornament plants, soil, etc. at a season at which the insect pests, sanitary pests or nematodes are expected to appear, before their appearance or at the time when their appearance is confirmed.

[0087] In general, the agricultural and horticultural insecticide of the present invention is used after being prepared into conveniently usable forms according to an ordinary manner for preparation of agrochemicals.

[0088] That is, the phthalic acid diamide derivative of the general formula (I) and, optionally, an adjuvant are blended with a suitable inert carrier in a proper proportion and prepared into a suitable preparation form such as a suspension, emulsifiable concentrate, soluble concentrate, wettable powder, granules, dust or tablets through dissolution, dispersion, suspension, mixing, impregnation, adsorption or sticking.

[0089] The inert carrier used in this invention may be either solid or liquid. As the solid carrier, there can be exemplified soybean flour, cereal flour, wood flour, bark flour, saw dust, powdered tobacco stalks, powdered walnut shells, bran, powdered cellulose, extraction residues of vegetables, powdered synthetic polymers or resins, clays (e.g. kaolin, bentonite, and acid clay), talcs (e.g. talc and pyrophyllite), silica powders or flakes (e.g. diatomaceous earth, silica sand, mica and white carbon, i.e. synthetic, high-dispersion silicic acid, also called finely divided hydrated silica or hydrated silicic acid, some of commercially available products contain calcium silicate as the major component), activated carbon, powdered sulfur, powdered pumice, calcined diatomaceous earth, ground brick, fly ash, sand, calcium carbonate powder, calcium phosphate powder and other inorganic or mineral powders, chemical fertilizers (e.g. ammonium sulfate, ammonium phosphate, ammonium nitrate, urea and ammonium chloride), and compost. These carriers may be used alone or as a mixture thereof.

[0090] The liquid carrier is that which itself has solubility or which is without such solubility but is capable of dispersing an active ingredient with the aid of an adjuvant. The following are typical examples of the liquid carrier and can be used alone or as a mixture thereof. Water; alcohols such as methanol, ethanol, isopropanol, butanol and ethylene glycol; ketones such as acetone, methyl ethyl ketone, methyl isobutyl ketone, diisobutyl ketone and cyclohexanone; ethers such as ethyl ether, dioxane, Cellosolve, dipropyl ether and tetrahydrofuran; aliphatic hydrocarbons such as kerosene and mineral oils; aromatic hydrocarbons such as benzene, toluene, xylene, solvent naphtha and alkyl naphthalenes; halogenated hydrocarbons such as dichloroethane, chloroform, carbon tetrachloride and chlorobenzene; esters such as ethyl acetate, diisopropyl phthalate, dibutyl phthalate and dioctyl phthalate; amides such as dimethylformamide, diethylformamide and dimethylacetamide; nitriles such as acetonitrile; and dimethyl sulfoxide.

[0091] The following are typical examples of the adjuvant, which are used depending upon purposes and used alone or in combination in some cases, or need not to be used at all.

[0092] To emulsify, disperse, dissolve and/or wet an active ingredient, a surfactant is used. As the surfactant, there can be exemplified polyoxyethylene alkyl ethers, polyoxyethylene alkylaryl ethers, polyoxyethylene higher fatty acid esters, polyoxyethylene resins, polyoxyethylene sorbitan mono-laurate, polyoxyethylene sorbitan monooleate, alkylarylsulfonates, naphthalenesulfonic acid condensation products, ligninsulfonates and higher alcohol sulfate esters.

[0093] Further, to stabilize the dispersion of an active ingredient, tackify it and/or bind it, there may be used adjuvants such as casein, gelatin, starch, methyl cellulose, carboxymethyl cellulose, gum arabic, polyvinyl alcohols, turpentine, bran oil, bentonite and ligninsulfonates.

[0094] To improve the flowability of a solid product, there may be used adjuvants such as waxes, stearates and alkyl phosphates.

[0095] Adjuvants such as naphthalenesulfonic acid condensation products and polycondensates of phosphates may be used as a peptizer for dispersible products.

[0096] Adjuvants such as silicon oils may also be used as a defoaming agent.

[0097] The content of the active ingredient may be varied as required. In dusts or granules, the suitable content thereof is from 0.01 to 50% by weight. In emulsifiable concentrates or flowable wettable powders, it is also from 0.01 to 50% by weight.

[0098] The agricultural and horticultural insecticide of the present invention is used to control a variety of insect pests in the following manner. That is, it is applied to a crop on which the insect pests are expected to appear or a site where the appearance of the insect pests is undesirable, as it is or after being properly diluted with or suspended in water or the like, in an amount effective for control of the insect pests.

5 [0099] The applying dosage of the agricultural and horticultural insecticide of the present invention is varied depending upon various factors such as a purpose, insect pests to be controlled, a growth state of a plant, tendency of insect pests appearance, weather, environmental conditions, a preparation form, an application method, an application site and an application time. It may be properly chosen in a range of 0.1 g to 10 kg (in terms of the active ingredient) per 10 ares depending upon purposes.

10 [0100] The agricultural and horticultural insecticide of the present invention may be used in admixture with other agricultural and horticultural disease or pest controllers in order to expand both spectrum of controllable diseases and insect pest species and the period of time when effective applications are possible or to reduce the dosage.

15 [0101] Typical examples of the present invention are described below, but they should not be construed as limiting the scope of the invention.

EXAMPLES

Example 1

20 (1-1) Production of 3-chloro-N-[4-(1,1,2,2-tetrafluoroethoxy)-2-methylphenyl]phthalimide

[0102] In 10 ml of acetic acid were dissolved 0.55 g of 3-chlorophthalic anhydride and 0.67 g of 4-(1,1,2,2-tetrafluoroethoxy)-2-methylaniline, and the reaction was carried out with heating under reflux for 3 hours. After completion of the reaction, the solvent was distilled off under reduced pressure and the resulting residue was washed with an ether-hexane mixed solvent to obtain 1.1 g of the desired compound.

Physical property: m.p. 121 - 122°C.

Yield: 95%.

30 (1-2) Production of 3-chloro-N¹-[4-(1,1,2,2-tetrafluoroethoxy)-2-methylphenyl]-N²-isopropylphthalic acid diamide (compound No. 141) and 6-chloro-N¹-[4-(1,1,2,2-tetrafluoroethoxy)-2-methylphenyl]-N²-isopropylphthalic acid diamide (compound No. 239)

[0103] In 10 ml of dioxane was dissolved 1.1 g of 3-chloro-N-[4-(1,1,2,2-tetrafluoroethoxy)-2-methylphenyl] phthalimide, followed by adding thereto 0.5 g of isopropylamine, and the reaction was carried out at 80°C for 3 hours. After completion of the reaction, the solvent was distilled off under reduced pressure and the resulting residue was purified by a silica gel column chromatography using a hexane/ethyl acetate (2/1) mixed solvent as an eluent, to obtain 0.4 g of the desired compound (compound No. 141) having an Rf value of 0.5 to 0.7 and 0.5 g of the other desired compound (compound No. 239) having an Rf value of 0.2 to 0.4.

40 Compound No. 141:

[0104]

45 Physical property: m.p. 202 - 204°C.
Yield: 31%.

Compound No. 239:

50 [0105]

Physical property: m.p. 199 - 201°C.
Yield: 39%.

Example 2

(2-1) Production of N-(4-trifluoromethoxyphenyl)-3-nitrophthalimide

5 [0106] In 50 ml of acetic acid were dissolved 5.97 g of 3-nitrophthalic anhydride and 5.31 g of 4-trifluoromethoxy-aniline, and the reaction was carried out with heating under reflux for 3 hours. After completion of the reaction, the solvent was distilled off under reduced pressure and the resulting residue was washed with an ether-hexane mixed solvent to obtain 10.2 g of the desired compound.

10 Physical property: m.p. 149 - 150°C.
Yield: 97%.

(2-2) Production of 3-amino-N-(4-trifluoromethoxyphenyl)phthalimide

15 [0107] In a pressure vessel were placed 10.0 g of N-(4-trifluoromethoxyphenyl)-3-nitrophthalimide, 100 ml of acetic acid and 0.5 g of 5% palladium carbon, and catalytic reduction with hydrogen was carried out at a hydrogen pressure of 5 kg/cm². After completion of the reaction, the catalyst was filtered off and the filtrate was concentrated under reduced pressure. The resulting residue was washed with an ether-hexane mixed solvent to obtain 9.0 g of the desired compound.

20 Physical property: m.p. 161 - 162°C.
Yield: 98%.

(2-3) Production of 3-bromo-N-(4-trifluoromethoxyphenyl)phthalimide

25 [0108] In 20 ml of acetic acid was dissolved 1.6 g of 3-amino-N-(4-trifluoromethoxyphenyl)phthalimide, and a solution of 0.35 g of sodium nitrite in 5 ml of concentrated sulfuric acid was added dropwise while maintaining the temperature at 15°C or lower. The resulting mixture was stirred at 15°C or lower for another 20 minutes to obtain a diazonium salt. The diazonium salt was slowly added to a mixture of a solution of 0.86 g of cuprous bromide in 50 ml of hydrobromic acid and 10 ml of toluene which was maintained at 80°C. The resulting mixture was stirred until foaming ceased. After completion of the reaction, the organic layer was washed with an aqueous sodium thiosulfate solution and an aqueous sodium chloride solution, dried over anhydrous magnesium sulfate, and then distilled under reduced pressure to remove the solvent, and the resulting residue was purified by a silica gel chromatography to obtain 1.3 g of the desired compound.

35 Physical property: m.p. 117 - 118°C.
Yield: 67%.

(2-4) Production of 3-bromo-N¹-(4-trifluoromethoxyphenyl)-N²-isopropylphthalic acid diamide (compound No. 262) and 40 6-bromo-N¹-(4-trifluoromethoxyphenyl)-N²-isopropylphthalic acid diamide (compound No. 302)

[0109] From 1.3 g of 3-bromo-N-(4-trifluoromethoxyphenyl)phthalimide, 0.5 g of the desired compound (compound No. 262) and 0.7 g of the other desired compound (compound No. 302) were obtained in the same manner as in Example 1-2.

45 Compound No. 262:

[0110]

50 Physical property: m.p. 208 - 210°C.
Yield: 33%.

Compound No. 302:

55 [0111]

Physical property: m.p. 210 - 212°C.
Yield: 47%.

Example 3

(3-1) Production of N-(4-difluoromethoxy-2-methylphenyl)-3-nitrophthalimide

5 [0112] In 100 ml of acetic acid were dissolved 5.8 g of 3-nitrophthalic anhydride and 5.2 g of 4-difluoromethoxy-2-methylaniline, and the reaction was carried out with heating under reflux for 3 hours. After completion of the reaction, the solvent was distilled off under reduced pressure and the resulting residue was washed with an ether-hexane mixed solvent to obtain 10.2 g of the desired compound.

10 Physical property: m.p. 163 - 164°C.

Yield: 98%.

(3-2) Production of N¹-(4-difluoromethoxy-2-methylphenyl)-N²-isopropyl-3-nitrophthalic acid diamide (compound No. 696)

15 [0113] In 100 ml of dioxane was dissolved 10 g of N-(4-difluoromethoxy-2-methylphenyl)-3-nitrophthalimide, followed by adding thereto 2.5 g of isopropylamine, and the reaction was carried out for 3 hours. After completion of the reaction, the solvent was distilled off under reduced pressure and the resulting residue was washed with ether to obtain 4.0 g of the desired compound.

20 Physical property: m.p. 148 - 149°C.

Yield: 86%.

(3-3) Production of 3-amino-N¹-(4-difluoromethoxy-2-methylphenyl)-N²-isopropylphthalic acid diamide

25 [0114] In a pressure vessel were placed 5 g of N¹-(4-difluoromethoxy-2-methylphenyl)-N²-isopropyl-3-nitrophthalic acid diamide, 50 ml of acetic acid and 0.25 g of 5% palladium carbon, and catalytic reduction with hydrogen was carried out at a hydrogen pressure of 5 kg/cm². After completion of the reaction, the catalyst was filtered off and the filtrate was concentrated under reduced pressure. The resulting residue was washed with an ether-hexane mixed solvent to obtain 30 4.0 g of the desired compound.

Physical property: m.p. 148 - 149°C.

Yield: 86%.

35 (3-4) Production of N¹-(4-difluoromethoxy-2-methylphenyl)-3-iodo-N²-isopropylphthalic acid diamide (compound No. 387)

[0115] In 20 ml of acetic acid was dissolved 1.89 g of 3-amino-N¹-(4-difluoromethoxy-2-methylphenyl)-N²-isopropylphthalic acid diamide, and 1.5 g of concentrated sulfuric acid was added under ice-cooling. While maintaining the resulting solution at 15°C or lower, a solution of 0.35 g of sodium nitrite in 0.5 ml of water was added dropwise. The resulting solution was stirred at 15°C or lower for another 20 minutes to obtain a diazonium salt. The diazonium salt was slowly added to a mixture of 50 ml of an aqueous solution containing 1.0 g of potassium iodide and 50 ml of chloroform which was maintained at 40°C. The resulting mixture was stirred until foaming ceased. After completion of the reaction, the organic layer was washed with an aqueous sodium thiosulfate solution and an aqueous sodium chloride solution, dried over anhydrous magnesium sulfate, and then distilled under reduced pressure to remove the solvent, and the resulting residue was purified by a silica gel chromatography to obtain 0.8 g of the desired compound.

Physical property: m.p. 207 - 209°C.

Yield: 33%.

50 Example 4

(4-1) Production of 3-iodo-2-N-isopropyl-phthalamic acid

55 [0116] A solution of 0.67 g of isopropylamine in 5 ml of acetonitrile was added dropwise to a solution of 1.37 g of 3-iodophthalic anhydride in 10 ml of acetonitrile under ice-cooling, and the reaction was carried out with stirring at room temperature for another 5 hours. After completion of the reaction, the crystals formed in the reaction solution were collected by filtration and washed with a small volume of acetonitrile to obtain 1.45 g of the desired compound.

Yield: 87%.

¹H-NMR [CDCl₃/TMS, δ values (ppm)]

1.23(6H, d), 4.35(1H, m), 5.80(1H, d), 6.85(1H, broad), 7.07(1H, t), 7.93(1H, d), 7.96(1H, d).

5 (4-2) Production of 6-iodo-N-isopropyl-phthalic acid isoimide

[0117] In 10 ml of toluene was dissolved 0.45 g of 3-iodo-2-N-isopropyl-phthalamic acid, followed by adding thereto 0.85 g of trifluoroacetic anhydride, and the reaction was carried out with stirring for 30 minutes. After completion of the reaction, the solvent was distilled off under reduced pressure to obtain 0.43 g of the desired compound as a crude product. The obtained desired compound was used in the subsequent reaction without purification.

Physical property: m.p. 87.5 - 88.5°C.

15 (4-3) Production of 3-iodo-N¹-(4-pentafluoroethyl-2-methylphenyl)-N²-isopropyl-phthalic acid diamide (compound No. 372)

[0118] In 10 ml of tetrahydrofuran was dissolved 0.43 g of the 6-iodo-N-isopropyl-phthalic acid isoimide obtained in 4-2, followed by adding thereto 0.30 g of 4-pentafluoroethyl-2-methylaniline, and the reaction was carried out with stirring for 1 hour. After completion of the reaction, the solvent was removed from the reaction solution by distillation under reduced pressure, and the resulting residue was washed with ether-n-hexane to obtain 0.70 g of the desired compound.

Physical property: m.p. 195 - 196°C.

Yield: 95%.

25 Example 5

[0119] (5-1) Production of ethyl 6-nitro-N-(4-chloro-2-methylphenyl)-phthalamate

[0120] In 30 ml of tetrahydrofuran was dissolved 1.29 g of 3-nitro-2-ethoxycarbonylbenzoyl chloride, followed by adding thereto 0.71 g of 4-chloro-2-methylaniline and 0.56 g of triethylamine, and the reaction was carried out with stirring for 30 minutes. After completion of the reaction, the reaction solution containing the desired compound was poured into water and the desired compound was extracted with ethyl acetate. The extracted solution was dried over anhydrous magnesium sulfate and distilled under reduced pressure to remove the solvent, and the resulting residue was purified by a silica gel column chromatography to obtain 1.7 g of the desired compound.

35 Physical property: m.p. 164 - 165°C.

Yield: 94%.

(5-2) Production of 3-nitro-N¹-(4-chloro-2-methylphenyl)-N²-isopropyl-phthalic acid diamide (compound No. 664)

[0121] In 20 ml of dioxane was dissolved 1.7 g of ethyl 6-nitro-N-(4-chloro-2-methylphenyl)-phthalamate, followed by adding thereto 1.5 g of isopropylamine, and the reaction was carried out with stirring at 80°C for 1 hour. After completion of the reaction, the solvent was removed from the reaction solution containing the desired compound, by distillation under reduced pressure, and the resulting residue was purified by a silica gel column chromatography to obtain 1.5 g of the desired compound.

45 Physical property: m.p. 202 - 204°C.
Yield: 85%.

Example 6

50 (6-1) Production of N-isopropyl-3,4-dichlorophthalamic acid

[0122] In 30 ml of tetrahydrofuran was dissolved 2.32 g of N-isopropyl-3,4-dichlorobenzamide, and 21 ml of s-BuLi (0.96 M/L) was slowly added while maintaining the temperature at -70°C. The resulting mixture was stirred at -70°C for 30 minutes, after which the cooling bath was removed. An excess of carbon dioxide was introduced into the reaction solution, and the thus treated solution was stirred at room temperature for 30 minutes to carry out the reaction.

[0123] After completion of the reaction, the reaction solution was poured into water and acidified with diluted hydrochloric acid, and the desired compound was extracted with ethyl acetate. The extracted solution was dried over anhy-

drous magnesium sulfate and distilled under reduced pressure to remove the solvent, and the crystals thus obtained were washed with an ether-hexane mixed solvent to obtain 2.4 g of the desired compound.

Physical property: m.p. 155 - 156°C.

Yield: 86.9%.

(6-2) Production of N-isopropyl-3,4-dichlorophthalic acid isoimide

[0124] In 10 ml of toluene was dissolved 0.41 g of N-isopropyl-3,4-dichlorophthalamic acid, followed by adding thereto 0.42 g of trifluoroacetic anhydride, and the reaction was carried out with stirring at room temperature for 30 minutes. After completion of the reaction, the solvent was distilled off under reduced pressure to obtain 0.39 g of the desired compound as a crude product. The obtained desired compound was used in the subsequent reaction without purification.

[0125] (6-3) Production of 3,4-dichloro-N¹-(4-pentafluoroethyl-2-methylphenyl)-N²-isopropylphthalic acid diamide (compound No. 1222)

[0125] In 10 ml of acetonitrile was dissolved 0.39 g of N-isopropyl-3,4-dichlorophthalic acid isoimide, followed by adding thereto 0.34 g of 4-pentafluoroethyl-2-methylaniline, and the reaction was carried out with stirring for 2 hours. After completion of the reaction, the reaction solution was maintained at 0°C for 10 minutes and the crystals precipitated were collected by filtration and washed with hexane to obtain 0.61 g of the desired compound.

Physical property: m.p. 208 - 209°C.

Yield: 84.1%.

25

Example 7

Production of 3-chloro-2-isopropylaminothiocarbonyl-N-(pentafluoroethyl-2-methylphenyl)benzamide (compound No. S-1)

30

[0126] In 20 ml of tetrahydrofuran was dissolved 1.06 g of N-(pentafluoroethyl-2-methylphenyl)-3-chlorobenzamide, and 7 ml of s-BuLi (0.96 M/L) was slowly added while maintaining the temperature at -70°C. The resulting mixture was stirred at -70°C for 30 minutes, after which the cooling bath was removed. A solution of 0.33 g of isopropyl isothiocyanate in 5 ml of tetrahydrofuran was poured into the reaction solution, and the resulting solution was stirred at room temperature for 30 minutes to carry out the reaction.

35

[0127] After completion of the reaction, the reaction solution was poured into water and acidified with diluted hydrochloric acid, and the desired compound was extracted with ethyl acetate. The extracted solution was dried over anhydrous magnesium sulfate and distilled under reduced pressure to remove the solvent, and the crystals thus obtained were washed with an ether-hexane mixed solvent to obtain 1.2 g of the desired compound.

40

Physical property: m.p. 162 - 164°C.

Yield: 86%.

45

[0128] Typical preparation examples and test examples of the present invention are described below but they should not be construed as limiting the scope of the invention.

[0129] In the preparation examples, parts are all by weight.

Formulation Example 1

50 [0130]

55

Each compound listed in Table 1	50 parts
Xylene	40 parts
Mixture of polyoxyethylene nonylphenyl ether and calcium alkylbenzenesulfonate	10 parts

[0131] An emulsifiable concentrate was prepared by mixing uniformly the above ingredients to effect dissolution.

Formulation Example 2

5 [0132]

10

Each compound listed in Table 1	3 parts
Clay powder	82 parts
Diatomaceous earth powder	15 parts

15 [0133] A dust was prepared by mixing uniformly and grinding the above ingredients.

Formulation Example 3

20 [0134]

25

Each compound listed in Table 1	5 parts
Mixed powder of bentonite and clay	90 parts
Calcium lignin sulfonate	5 parts

30 [0135] Granules were prepared by mixing the above ingredients uniformly, and kneading the resulting mixture together with a suitable amount of water, followed by granulation and drying.

Formulation Example 4

35 [0136]

40

Each compound listed in Table 1	20 parts
Mixture of kaolin and synthetic high-dispersion silicic acid	75 parts
Mixture of polyoxyethylene nonylphenyl ether and calcium alkylbenzenesulfonate	5 parts

45 [0137] A wettable powder was prepared by mixing uniformly and grinding the above ingredients.

Test Example 1

Insecticidal effect on diamondback moth (Plutella xylostella)

50 [0138] Adult diamondback moths were released and allowed to oviposit on a Chinese cabbage seedling. Two days after the release, the seedling having eggs deposited thereon was immersed for about 30 seconds in a liquid chemical prepared by diluting a preparation containing each compound listed in Table 1 as an active ingredient to adjust the concentration to 500 ppm. After air-drying, it was allowed to stand in a room thermostated at 25°C. Six days after the immersion, the hatched insects were counted. The mortality was calculated according to the following equation and the insecticidal effect was judged according to the criterion shown below. The test was carried out with triplicate groups of 10 insects.

$$\text{Corrected mortality (\%)} = \frac{\left[\frac{\text{Number of hatched insects}}{\text{in untreated group}} \right] - \left[\frac{\text{Number of hatched insects}}{\text{in treated group}} \right]}{\left[\frac{\text{Number of hatched insects}}{\text{in untreated group}} \right]} \times 100$$

5

Criterion:

[0139]

10

15

Effect	Mortality(%)
A	100
B	99 - 90
C	89 - 80
D	79 - 50

20

[0140] The results obtained are shown in Table 4.

Test Example 2

25 Insecticidal effect on common cutworm (Spodoptera Litura)

[0141] A piece of cabbage leaf (cultivar; Shikidori) was immersed for about 30 seconds in a liquid chemical prepared by diluting a preparation containing each compound listed in Table 1 as an active ingredient to adjust the concentration to 500 ppm. After air-drying, it was placed in a plastic Petri dish with a diameter of 9 cm and inoculated with second-instar larvae of common cutworm, after which the dish was closed and then allowed to stand in a room thermostated at 25°C. Eight days after the inoculation, the dead and alive were counted. The mortality was calculated according to the following equation and the insecticidal effect was judged according to the criterion shown in Test

Example 1. The test was carried out with triplicate groups of 10 insects.

35

[0142]

40

$$\text{Corrected mortality (\%)} = \frac{\left[\frac{\text{Number of alive larvae}}{\text{in untreated group}} \right] - \left[\frac{\text{Number of alive larvae}}{\text{in treated group}} \right]}{\left[\frac{\text{Number of alive larvae}}{\text{in untreated group}} \right]} \times 100$$

[0143] The results obtained are shown in Table 4.

45 Test Example 3

Insecticidal effect on rice leafroller (Cnaphalocrocis medinalis)

[0144] The lamina of a rice plant at the 6 to 8 leaf stage was immersed for about 30 seconds in a liquid chemical prepared by diluting a preparation containing each compound listed in Table 1 as an active ingredient to adjust the concentration to 500 ppm. After air-drying, the lamina was placed in a plastic Petri dish with a diameter of 9 cm whose bottom had been covered with a wetted filter paper. The lamina was inoculated with third-instar larvae of rice leafroller, after which the dish was allowed to stand in a room thermostated at 25°C and having a humidity of 70%. Four days after the inoculation, the dead and alive were counted and the insecticidal effect was judged according to the criterion shown in

55 Test Example 1. The test was carried out with triplicate groups of 10 insects.

[0145] The results obtained are shown in Table 4.

Table 4

No	Test Example 1	Test Example 2	Test Example 3
1	D	D	A
2	A	C	
3	C	A	
4	A		D
7	A		
8	A	A	A
9	A		A
10	A	D	D
11	A	C	C
12	A	D	D
13	D		
14	A		A
15	A		
16	A		
17	A		D
18	D		A
20	A		

45

50

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Table 4 (Cont'd)

No	Test Example 1	Test Example 2	Test Example 3
22	A	D	
23	A		D
24	A		D
25	A		A
26	A		D
27	A	A	C
28			A
29	A	B	A
30	A	A	A
31	A		
32	A		
33	A		
34	A	C	
37	A		
41	A		A
42	A	D	A
43	B	D	
44			A
45	A		A
46	A		B
47	A	D	A
48	A	B	A
49	A	A	A
50	A	A	A

Table 4 (Cont'd)

	No	Test Example 1	Test Example 2	Test Example 3
5	51	A		A
10	52	A	A	A
15	53	A		A
20	55	A	B	A
25	56	A	A	A
30	58	A	A	A
35	59	A		
40	60	A	A	A
45	61	A	B	A
50	62	A	A	A
	63	A	B	A
	64	A	B	A
	65	A	A	A
	66	A	A	B
	67	A	A	A
	68	A		
	69	A		A
	70	A		A
	71			D
	73	A		
	74	A		
	75	A		A
	76	C		B
	77	A	C	A

Table 4 (Cont'd)

5

10

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No	Test Example 1	Test Example 2	Test Example 3
78	A	A	A
79	A	A	D
81			A
83	A	A	A
84	A		
86	B		B
87	A		A
88	A		
89	A	B	A
90	A	A	B
91	A	A	A
92	A		
93	A	A	A
98	A		C
99	A		A
100	A	A	A
101	A		
102	A	D	A
103	A	C	A
109	A	A	C
110	A		A
111	A	C	B
112	A	A	A
113	A	B	A

55

Table 4 (Cont'd)

No	Test Example 1	Test Example 2	Test Example 3
114	A	A	A
115	A	C	A
116	A	D	A
117	A	A	A
118	A	A	A
119	A	A	A
120	A	D	A
121	A	A	A
122	A	A	A
123	A		A
124	A	A	A
125	A	B	A
126	A	A	A
127	A	A	A
128	A	D	A
129	A	A	A
130	A	A	A
132	A	A	A
133	A	A	A
134	A		A
135	A	A	A
136	A	A	A
137	A		A
138	A	A	A

Table 4 (Cont'd)

No	Test Example 1	Test Example 2	Test Example 3
139	A	A	A
140	A	A	A
141	A	A	A
142	A	A	B
143	A	A	A
144	A	A	A
145	A	A	A
146	A	A	A
147	A	C	
148	A	A	A
149	A	A	A
150	A	A	A
151	A		
152	A	A	A
153	A		D
157	A	A	A
158	A	A	A
159	A	A	A
161	A	D	A
162	A	A	B
163	A	A	A
164	A	A	
165	A	B	C
167	A	A	A

Table 4 (Cont'd)

No	Test Example 1	Test Example 2	Test Example 3
168	A		
169	A	D	
170	A	D	B
171	A		D
172	A	A	D
173	A	D	D
174	A		
175	A		
176	A	D	A
177	A	A	A
178	A		A
179	A		
180	A	A	A
181		A	
183	A	B	
185	A		
186	D		
187	A		D
188	D		D
189	A		
190	A		
191	A		A
192	A		
193	A	D	

Table 4 (Cont'd)

No	Test Example 1	Test Example 2	Test Example 3
194	A		
195	A		
196	A		D
197	A	A	A
198	A	C	A
199	A		
200	A		A
201	A	B	A
202	A		
203	A		
206	A		A
207	A		
208	A		
209	A		B
210	A		D
211	A		A
212	A	D	A
213	A	A	A
214	A	A	A
215	A	D	
216	A		A
217	A		A
218	A		C
219	A	D	A

Table 4 (Cont'd)

	No	Test Example 1	Test Example 2	Test Example 3
5	220	A		A
10	221	A	A	A
15	222	A	B	A
20	223	A	A	A
25	225	A	B	A
30	226	A		A
35	227	A		
40	228		B	A
45	229	A	D	A
50	230	A	C	A
	231		B	A
	232	A		A
	233	A		
	234	A		A
	235	A		A
	236	A	A	A
	237	A		A
	238	A		A
	239	A	A	A
	240	A		
	241	A	B	A
	242	A	B	A
	243	A	A	B
	244	A	C	

Table 4 (Cont'd)

	No	Test Example 1	Test Example 2	Test Example 3
5	245	A	D	
10	246	A	B	B
15	248	A	C	
20	249	A	D	A
25	250	A		D
30	251	A		A
35	252	A		
40	253	A	A	C
45	254	A	A	
50	255	A		A
55	256	A		
60	257	A		B
65	258	A		A
70	259	A		D
75	261	A	A	D
80	262	A	A	D
85	263	A		A
90	264	-	D	A
95	265	A		
100	266	A	A	A
105	267	A	A	A
110	268	A	A	A
115	269	A	A	A
120	270	A	A	A

Table 4 (Cont'd)

No	Test Example 1	Test Example 2	Test Example 3
271	A	A	A
272	A	A	A
273	A	D	D
274	A	A	A
275	A	D	A
276	A	A	A
277	A	A	A
278	A	A	A
279	A	A	A
281	A	A	A
282	A	A	A
283	A	A	A
284	A	A	A
285	A	D	A
286	A	A	A
287	A	A	A
288	A	A	A
289	A	A	A
290	A	A	A
291	A	A	A
292	A	A	A
293	A	A	A
294	A	A	A
295	D		

Table 4 (Cont'd)

	No	Test Example 1	Test Example 2	Test Example 3
5	296	A	A	A
10	297	A	A	B
15	298	A	A	A
20	299	A	A	A
25	300	A		A
30	301	A	A	D
35	302	A		D
40	303	A		D
45	304	A		
50	305	A	A	A
55	306	A	A	A
60	307	A		D
65	308	A		
70	309	A	A	
75	310	A		
80	311	A		D
85	312	A	A	A
90	313	A	A	A
95	314	A		A
100	315	A		A
105	316	A	A	A
110	318	A	B	A
115	319	A	B	B
120	320	A		D

Table 4 (Cont'd)

	No	Test Example 1	Test Example 2	Test Example 3
5	321	A	A	
10	322	A		B
15	323	A	C	A
20	324	A		A
25	325	A	A	A
30	326	A		A
35	327	A		A
40	328	A	A	A
45	329	A	A	A
50	330	A		A
	332	A		A
	333	A		D
	334	A	C	C
	335	A		B
	336	A		D
	337	A		A
	338	A	B	A
	339	A	B	A
	340	A		A
	341	A		A
	342	A		
	343	A		
	345	A	B	A
	346	A	C	A

Table 4 (Cont'd)

	No	Test Example 1	Test Example 2	Test Example 3
5	347	A	B	C
10	348	A		A
15	349			A
20	350	A	A	A
25	351	A	A	A
30	352			A
35	353	A	A	A
40	354	A	A	A
45	355	A	C	A
50	356	A	A	A
55	360	A	D	A
60	361	A	A	A
65	362	A	A	A
70	363	A	A	A
75	364	A	A	D
80	365	A	A	A
85	366	A	A	A
90	367	A	A	A
95	368	A	A	A
100	369	A	A	A
105	370	A	A	A
110	371	A	A	A
115	372	A	A	A
120	373	A	A	A

Table 4 (Cont'd)

	No	Test Example 1	Test Example 2	Test Example 3
5	374	A	A	A
10	375	A	A	A
15	376	A		A
20	377	A		A
25	378	A	D	A
30	379	A	A	A
35	380	A	A	A
40	381	A	A	A
45	382	A	B	A
50	383	A		A
	384	A		C
	385	A	B	A
	386	A	A	A
	387	A	A	A
	388	A	A	B
	389	A	A	A
	390	A	A	A
	391	A	A	A
	392	A	A	A
	393	A	A	A
	394	A	A	A
	395	A	A	A
	396	A	A	A
	397	A	A	A

Table 4 (Cont'd)

No	Test Example 1	Test Example 2	Test Example 3
398	A		
399	A	A	A
400	A	D	A
402	A		
403	A	B	A
404	A	A	A
406	A	A	A
407	A	A	A
408	A	B	A
409	A	A	A
410	A	A	A
411	A		
412	A		C
413	A		C
414	A		A
415			A
416	A	A	A
417	A	A	A
418			A
419	A	A	A
420	A		D
421	A	B	A
422	A		
424	A	A	

Table 4 (Cont'd)

No	Test Example 1	Test Example 2	Test Example 3
427	A		D
428	A		
429	A	D	
430	A	D	D
431	A	A	
432	A		A
433	A		A
434	A		
435	A	B	A
436	A	B	A
437	A	C	A
438	A	B	A
439	A	A	A
440	A	C	B
441	A		B
442	A		
443	A		D
444	A		A
445		B	A
446	A	A	A
447	A	B	C
448	A		A
449	A		
450	A		C

Table 4 (Cont'd)

No	Test Example 1	Test Example 2	Test Example 3
451	A	A	
452	A	A	A
453	A	D	A
454	A	A	A
455	A	B	A
456	A		A
457	A	A	B
458	A		
459	A		
460	A	B	
461	A		
462	A		
463	A		
464	A		A
465	A		
466	A		A
467	A		A
468	A	A	B
469	A	A	D
470	A	C	C
471	A	A	A
472	A		B
473	A	A	A
474	A	B	A

Table 4 (Cont'd)

	No	Test Example 1	Test Example 2	Test Example 3
5	475	A		D
10	476	A	A	A
15	477	A		C
20	478	A		
25	479	A		A
30	480	A	B	A
35	488	A	A	A
40	489	A	A	A
45	490	A	A	A
50	491	A	A	A
	492	A	A	A
	493	A	A	A
	494	A		A
	495	A	A	A
	496	A	A	A
	498	A	A	A
	499	A	A	A
	500	A	B	A
	501	A	A	A
	502	A	A	A
	503	A	B	A
	504	A	A	A
	505	A	A	A
	506	A		

Table 4 (Cont'd)

No	Test Example 1	Test Example 2	Test Example 3
5			
10	507 A	B	A
15	508 A	B	A
20	509 A	A	A
25	510 A	B	A
30	511 A	A	A
35	512 A	A	A
40	513 A	A	A
45	514 A	A	A
50	515 A		C
55	516 A	A	A
60	517 A	A	A
65	518 A		B
70	519 A	A	A
75	520 A		
80	521 A	A	A
85	522 A	D	A
90	523 A	A	A
95	524 A	A	A
100	526 A	A	
105	527 A	A	A
110	528 A		A
115	529 A	D	A
120	530 A		D
125	531 A		A

Table 4 (Cont'd)

	No	Test Example 1	Test Example 2	Test Example 3
5	532	A		A
10	533	A	A	A
15	534	A		A
20	535	A	A	
25	536			A
30	537	A		A
35	538	A	A	
40	539	A		
45	540	A		
50	543	A		A
55	544	A		A
60	545	A		A
65	546	A		A
70	547	A	A	D
75	548	A	A	A
80	549	A	A	D
85	550	A	C	A
90	551	A		A
95	552	A		B
100	553	A	C	A
105	554	A		A
110	555	A		B
115	557	A	C	B
120	558	A	A	A

Table 4 (Cont'd)

	No	Test Example 1	Test Example 2	Test Example 3
5	559	A		
10	560	A		
15	561	A	C	A
20	562	A		A
25	563	A		A
30	564	A		B
35	565	A		A
40	566	A		B
45	567	A	D	D
50	568	A	C	A
	569	A	A	A
	570	A	A	
	571	A	C	
	573	A		
	575	A		A
	576	A		C
	577	A		A
	579	A	A	A
	580	A		A
	581	A	B	A
	582	A		A
	584	A	D	
	585	A		A
	586	A		D

Table 4 (Cont'd)

No	Test Example 1	Test Example 2	Test Example 3
587	A		
588	A		
589	A		A
590	A		
591	A	D	
592	A		
593	A		
594	A		
595	A	A	A
596	D		D
597	B		
598	A		
599	A	D	A
600	A		
601	A		
602	A		A
603	B		C
604	A		D
605			C
606	A	D	A
607	A	A	A
608	A		
609	A	B	A
50	610	A	C

Table 4 (Cont'd)

No	Test Example 1	Test Example 2	Test Example 3
611	A		A
612	A		D
613	A		
614	A		
615	A		
616	A		D
617	A	A	A
618	A	A	A
619	A	A	A
621	A		
622	A		
623	A		A
624	A		
625	A	D	D
626	A		
628	A	B	A
633	A	D	
634	A		D
635	A	D	
636	A	D	A
637	A		
638	B		
639	A		
640	A		

Table 4 (Cont'd)

	No	Test Example 1	Test Example 2	Test Example 3
5	641	D	D	
10	642	A		
15	643	A		A
20	644	A	A	
25	645	A		
30	646	A	D	
35	647	A		B
40	648	A	D	A
45	649	A		C
50	650	A		
	652	A		
	653	A		
	654		D	A
	656	A		
	657	D		
	658	A		
	659	A		
	660	A		A
	661	B		D
	662	A		
	663	A	A	D
	664	A	A	
	665	A	A	B
	666	A		D

Table 4 (Cont'd)

No	Test Example 1	Test Example 2	Test Example 3
667	A	A	A
668	A		
669	A	D	A
670	A		D
671	A		D
672	A		
673	A	D	D
674	A	D	A
675	A	A	A
676	A	C	A
677	A		
678	A		
679	A		A
680	A		D
681	A	A	A
682	A		A
683	A	A	A
684	A	A	A
686	A	A	A
687	A	D	D
688	A		A
689	A	D	A
690	A		A
691	A	D	C

Table 4 (Cont'd)

	No	Test Example 1	Test Example 2	Test Example 3
5	692	A	D	
10	693	A	A	
15	694	A		A
20	695	A	A	A
25	696	A	A	A
30	697	A		A
35	698	A	B	A
40	699	A	A	D
45	700	A	A	A
50	701	A	A	A
	703	A	A	A
	704	A		A
	705	A	D	A
	706	A	A	
	708	D		
	709	A	A	
	710	A	C	A
	711	A	C	A
	712	A	A	A
	713	A	B	D
	714	A	A	A
	715	A	A	A
	716	A	A	A
	717	A		A

Table 4 (Cont'd)

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No	Test Example 1	Test Example 2	Test Example 3
718	A		A
719	A	D	
720	A		
721	A		
722	A		A
723	D		D
724	A		B
725	A	A	
727	A	B	A
728	A		A
729	A		A
732	A		
733	A		
735			D
737	A		
738	D		
740	A		A
741	A	A	A
742	A		
743	D		
744	C		
745	D		

Table 4 (Cont'd)

No	Test Example 1	Test Example 2	Test Example 3
749	A		
750	A		A
751	A		A
752	A		
753	A	A	D
755	A		A
758			A
759			D
765			A
766	A		
767	A	C	A
768	A	B	A
769	A		D
770	A	A	A
771	A		C
772	A		A
773	A		A
774	A		A
776	B		D
777	A		D
778	A		A
780	A	A	A
781	A	A	A

Table 4 (Cont'd)

No	Test Example 1	Test Example 2	Test Example 3
782	A		A
783	A	A	A
785		A	
788	C		C
790			A
791	A		A
793	A		
795	A	B	A
796	A		
797	A		C
798			A
799	A		A
800			C
801	A	A	D
802	D		
803	A		A
808	A		
819	A	B	A
821	A		A
822	D		D
824	A		
825	A		

Table 4 (Cont'd)

No	Test Example 1	Test Example 2	Test Example 3
826	A		A
827	A		
830	C		
831	D	D	
832	A		
833	A		D
835	A		
836	A		A
837	A		
838	A	C	A
839	A		C
840	A		D
841	A	D	
842	A	A	D
845	A		
846	A		
847		D	
848	A		
849	A	B	A
850	A		A
851	A	D	A
852	A		
854	A		
855	A		

Table 4 (Cont'd)

No	Test Example 1	Test Example 2	Test Example 3
856	A		D
858	C	A	
859	D		
860	A		
861	A		
862	A	D	D
863	A		B
864	A		
865	A		
866	D		
867	A		C
869	A	D	
870	A		
871	A		
872	A		C
874	A	C	A
875	A		
878	C		
879	A		A
880		D	
881	A	D	
888	D		

Table 4 (Cont'd)

No	Test Example 1	Test Example 2	Test Example 3
889	A		A
890	A	A	A
891	A	A	A
892	A		A
893	A	A	A
894	A	A	A
895	A	A	A
901	A	D	A
902	A		
903	A	A	A
904	A		
905	A	A	A
906	A	D	A
907	A	A	A
908	A	D	A
909	A	A	A
910			A
911	A		D
912	A		
913	A		
914	A		
915	A	A	A
916	A		
917	A	A	A

Table 4 (Cont'd)

	No	Test Example 1	Test Example 2	Test Example 3
5	918	A		
10	919	A		
15	920	A		
20	924	A		
25	925	A		A
30	927	A	A	A
35	928	A		A
40	929	A	A	A
45	930	A	A	A
50	931	A	A	A
55	932	A	A	A
60	933	A		A
65	934	A	A	A
70	935	A	A	A
75	936	A	A	A
80	937	A	A	A
85	938	A	A	
90	939	A	A	A
95	940	A	A	A
100	941	A	A	A
105	942	A	A	A
110	943	A	C	A
115	944	A	A	A
120	945	A	A	A

Table 4 (Cont'd)

	No	Test Example 1	Test Example 2	Test Example 3
5	946	A		A
10	947	A	A	A
	949	A	A	A
15	950			C
	951	A	A	A
20	952	A		A
	953	A	A	A
25	954	A		A
	955	A	A	A
	956	A		A
30	957	A	A	A
	958	A		A
	959	A		A
35	965	A	C	
	966	A		B
	971	A	A	A
40	972		A	
	973	A	A	A
	974	A	A	A
45	975	A		A
	976	A	A	A
	977	A	A	A
50	978	A	C	A
	979	A	A	A

Table 4 (Cont'd)

	No	Test Example 1	Test Example 2	Test Example 3
5	980	A	A	A
10	981	A	A	A
15	982	A		C
20	983	A	A	A
25	984	A		A
30	985	A	A	A
35	986	A		A
40	987	A	A	A
45	988	A		A
50	989	A	A	A
	990	A		A
	991	A	A	A
	992	A		A
	993	A		A
	995	A		A
	996	A	A	A
	997	A	A	A
	998	A	A	A
	999	A		A
	1000	A	D	A
	1001	A	A	A
	1002	A	A	A
	1003	A	A	A
	1004	A	A	A

Table 4 (Cont'd)

	No	Test Example 1	Test Example 2	Test Example 3
5	1005	A	A	A
10	1006	A		
15	1007	A	A	A
20	1008	A		A
25	1009	A	A	A
30	1010	A		A
35	1011	A	A	A
40	1013	A	A	A
45	1014	A		A
50	1015	A	D	A
	1016			A
	1017	A	A	A
	1018	A	D	A
	1019	A	A	A
	1020	A	A	A
	1021	A		A
	1022	A	A	A
	1023	A	A	A
	1024	A	A	A
	1025	A		
	1026	A		A
	1027			A
	1028	A	A	A
	1031	A	A	A

Table 4 (Cont'd)

	No	Test Example 1	Test Example 2	Test Example 3
5	1032	A		A
10	1033	A	A	A
15	1034	A		
20	1035	A	A	A
25	1036	A		A
30	1037	A	A	A
35	1038	A	A	A
40	1039	A	A	A
45	1040	A	A	A
50	1041	A	A	A
	1042	A	A	A
	1043	A		A
	1044	A	A	A
	1045	A	A	A
	1046	A	A	A
	1047	A		A
	1048	A		A
	1049	A	A	A
	1050	A	A	A
	1051	A	A	A
	1052	A	A	
	1053	A	A	A
	1054	A	A	A
	1055	A	A	A

Table 4 (Cont'd)

No	Test Example 1	Test Example 2	Test Example 3
1056	A	A	A
1057	A		A
1058	A	A	A
1059	A		
1060	A	A	A
1061	A	A	A
1062	A	A	A
1063			A
1064	A		A
1065	A		
1066	A	C	A
1067	A	A	A
1068	A	A	A
1069	A	A	A
1070	A	A	A
1071	A	C	A
1072			A
1073	A	A	A
1074	A	A	A
1075	A	A	A
1076	A		A
1077	A		A
1078	A	A	A
1079	A	A	A

Table 4 (Cont'd)

	No	Test Example 1	Test Example 2	Test Example 3
5	1080	A	A	A
10	1081	A	A	A
15	1082	A		
20	1083	A		
25	1086	A		A
30	1087	A	A	A
35	1088	A		A
40	1089	A		A
45	1099	A		A
50	1100	A	C	A
	1101	A	C	A
	1102	A	A	A
	1103	A		A
	1104	A	A	A
	1105	A	A	A
	1106	A		A
	1107	A		A
	1108	A		A
	1109	A		A
	1110	A	C	A
	1111	A		A
	1112	A	A	A
	1113	A	A	A
	1114	A	A	A

Table 4 (Cont'd)

	No	Test Example 1	Test Example 2	Test Example 3
5	1115	A	A	A
10	1116	A	A	A
15	1117	A	A	A
20	1118	A	A	A
25	1119	A	A	A
30	1120	A	A	A
35	1121	A	A	A
40	1122	A	A	A
45	1123	A	A	A
50	1124	A	A	A
	1125	A	A	A
	1126	A	A	A
	1127	A	A	A
	1128	A	A	A
	1129	A	A	A
	1130	A	A	A
	1131	A	A	A
	1132	A		A
	1133	A		A
	1134	A		A
	1135	A		A
	1136	A		A
	1137	A		
	1138			A

Table 4 (Cont'd)

No	Test Example 1	Test Example 2	Test Example 3
1139	A		
1140			A
1141	A	A	A
1142	A	A	A
1143	A	C	A
1144	A	A	A
1145	A		A
1146	A	C	A
1147	A	A	A
1148	A	A	A
1149	A		A
1150	A	A	A
1151	A	A	A
1152	A	A	A
1153	A	A	A
1154	A	C	A
1155	A		A
1156	A	A	A
1157	A		A
1158	A	D	A
1159	A	A	A
1160	A	A	A
1161	A	D	A
1162	A	A	A

Table 4 (Cont'd)

	No	Test Example 1	Test Example 2	Test Example 3
5	1163	A	A	A
10	1164	A	A	A
15	1165	A	A	A
20	1166	A	A	A
25	1167	A	A	A
30	1168	A	A	A
35	1169	A	A	A
40	1173	A	A	A
45	1174	A	A	A
50	1175	A		
	1178	A		
	1179	A	A	-
	1180	A		-
	1181	A		-
	1182	A		-
	1183	A	A	-
	1184	A	A	-
	1185	A	C	-
	1186	A	A	-
	1187	A	A	-
	1188	A	A	-
	1189	A	A	-
	1190	A	A	A
	1191	A	A	A

Table 4 (Cont'd)

	No.	Test Example 1	Test Example 2	Test Example 3
5	1192	A	A	A
10	1193	A	A	A
15	1202	A	A	A
20	1203	A	D	A
25	1204	A	A	A
30	1205	A		A
35	1206	A	A	A
40	1207	A	A	A
45	1208	A		A
50	1209	A	D	A
	1210	A	A	A
	1211	A	A	A
	1212	A	A	A
	1221	A	A	A
	1222	A	A	A
	1223	A	A	A
	1224			B
	1225			A
	1226			A
	1227	A	A	A
	1228	A	A	A
	1229	A	A	A
	1230	A	A	A
	1231	A	A	A

Table 4 (Cont'd)

No	Test Example 1	Test Example 2	Test Example 3
1232	A	A	A
1233	A	A	-
1234	A	A	-
1235	A	D	-
1236	A	A	-
1237	A	A	-
1238	A		-
1245	A	A	-
1246	A	A	A
1247	C		A
1248	A	A	A
1249	A		
1250	A	A	A
1251	A	A	A
1256	A	A	-
1257	A	A	-
1258	A	A	-
1259	A		-
1260	A		-
1261	A	A	-
1262	A	A	A
1263	A	A	A
1264	A	A	A
1266	A		A

Table 4 (Cont'd)

	No	Test Example 1	Test Example 2	Test Example 3
5	1277	A	A	A
10	1278	A	A	A
15	1280	A	A	A
20	1281	A		A
25	1283	A	-	-
30	1284	A	-	A
35	1285	A	-	A
40	1287	A	A	A
45	1288	A		
50	1291	A		
55	1293			A
60	1294	A	A	A
65	1295	A	A	A
70	1296	A	A	A
75	1297	A	A	A
80	1298	A	A	A
85	1299	A	A	A
90	1300	A	A	A
95	1301	A		A
100	1303	A	A	A
105	1304	A		A
110	1305	A	A	A
115	1306			A
120	1307	A	A	A

Table 4 (Cont'd)

No	Test Example 1	Test Example 2	Test Example 3
1308			C
1309	A	A	A
1310			B
1311	A	A	A
1312	A		A
1313	A	A	A
1314	A	A	A
1315	A	A	A
1316	A	A	A
1317	A	C	A
1318	A		A
1319	A	-	-
1321	A	-	A
1322	A		
1323	A		A
1325	A		A
1327	A		
1328	A		
1330	A	A	A
1331	A		A
1332	A		
1333	A		A
1335	A	C	A
1337	A		A

Table 4 (Cont'd)

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No	Test Example 1	Test Example 2	Test Example 3
1338	A		
1339	A		A
1340	A		A
1341	A		
1342	A		
1343	A		A
1345	A		
1346	A		
1347	A		
1348	A		
1349	A		
1350			A
1351	A		A
1352	A		A
1353	A	A	A
1355	A	A	A
1356	A		
1358	A		C
1360	A		C
1361			A
1362	A	A	A
1363	A		
1364	A	A	A
1365	A		

Table 4 (Cont'd)

	No	Test Example 1	Test Example 2	Test Example 3
5	1366	A	A	A
10	1367	A		
15	1368	A		
20	1370	A		A
25	1372	A		
30	1373	A		
35	1374	A		
40	1376	A		
45	1379	A		
50	1381	A		C
	1382	A	A	A
	1383	A	A	A
	1384	A	A	A
	1385	A	A	A
	1386	A	A	A
	1387	A	A	A
	1388	A	D	A
	1389	A	A	A
	1390	A		A
	1392	A		A
	1393	A		A
	1394	A		A
	1395	A		
	1398	A		

Table 4 (Cont'd)

	No	Test Example 1	Test Example 2	Test Example 3
5	1399	A	A	A
10	1400	A	A	A
1401	1401	A		
15	1402	A	A	A
1404	1404	A	C	A
20	1406	A	A	A
1409	1409	A		A
25	1410	A		A
1411	1411	A		A
1412	1412	A		
30	1414	A	A	A
1415	1415	A		A
35	1416			A
1417	1417	A	A	A
1418	1418	A	A	A
35	1419	A		A
40	1420	A		A
1421	1421	A		
45	1423	A		
1424	1424		A	A
1427	1427	A	A	A
1428	1428	A	A	A
1429	1429	A	A	A
50	1430	A	D	A

Table 4 (Cont'd)

No	Test Example 1	Test Example 2	Test Example 3
1431	A		
1432			A
1434	A		
1436	A	A	A
1438	A	A	A
1439	A		C
1440	A		
1441	A		A
1442	A		
1443	A		
1445	A	A	A
1446	A		
1447	A	A	A
1448	A	A	A
1449	A	A	A
1450	A	A	A
1451	A		
1452	A	A	A
1453	A		
1454	A	A	A
1456	A		A
1457	A		A
1458	A	A	A

Table 4 (Cont'd)

No	Test Example 1	Test Example 2	Test Example 3
1459	A	A	
1460	A	C	A
1461	A		A
1464	A	A	A
1465	A		A
1466	A	A	A
1467	A	A	A
1468	A	C	A
1469	A		
1470	A		A
1472	A	A	A
1473	A	A	A
1474	A	A	A
1475	A	A	A
1476	A		
1478	A	A	A
1479	A	A	A
1480			
1481	A	A	A
1482	A	A	A
1484	A	A	A
1485	A	A	A

Table 4 (Cont'd)

No	Test Example 1	Test Example 2	Test Example 3
1486	A	A	
1487	A	A	
1488	A		A
1489	A	A	A
1490	A		A
1491	A	A	A
1492	A		A
1493	A		A
1494	A	A	A
1495	A	A	A
1496	A	A	A
1497	A	A	A
1498	A	A	A
1499	A	A	A
1500	A	A	A
1501	A	A	A
1502	A	A	A
1503	A	C	A
1504	A	A	A
1505	A	A	A
1506	A	A	A
1507	A	A	A
1508	A	C	A
1509	A	C	A

Table 4 (Cont'd)

No	Test Example 1	Test Example 2	Test Example 3
1510	A		A
1511	A		
1512	A	A	A
1513	A		
1514	A		A
1515	A		
1516	A	A	A
1517	A		A
1518	A		
1519	A		A
1520			A
1521	A		
1522	A	A	A
1523	A		A
1524	A	A	A
1525	A	A	A
1526	A	A	A
1527	A		A
1528	A		A
1529	A		A
1530	A		A
1531	A	A	A
1532	A	A	A
1533	A	A	A

Table 4 (Cont'd)

	No	Test Example 1	Test Example 2	Test Example 3
5	1534	A	A	A
10	1535	A	A	A
15	1536	A	A	A
20	1537	A	A	A
25	1538	A	A	A
30	1539	A	A	A
35	1540	A	A	A
40	1541	A	A	A
45	1542	A	D	A
50	1543	A	A	A
55	1544	A	A	A
60	1545	A	D	A
65	1546	A	C	A
70	1547	A		A
75	1548	A		A
80	1549	A	D	A
85	1550	A	A	A
90	1551	A	D	A
95	1552	A	A	A
100	1553	A		A
105	1554	A	A	
110	1555	A		A
115	1556	A	A	A
120	1557	A	A	A

Table 4 (Cont'd)

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No	Test Example 1	Test Example 2	Test Example 3
1558	A	C	A
1559	A	A	A
1560	A	A	A
1561	A	A	A
1562	A	A	A
1563	A	A	A
1565	A	A	A
1566	A	A	A
1567	A	A	A
1568	A	A	A
1569	A	A	A
1570			A
1571	A	A	A
1572	A	A	A
1573	A	A	A
1574	A	A	A
1575	A		A
1576	A	D	A
1577	A		
1578	A		A
1579	A		
1580	A	A	A
1581	A	A	A
1582	A		A

Table 4 (Cont'd)

No	Test Example 1	Test Example 2	Test Example 3
1583	A		A
1584	A		A
1585	A	A	A
1586	A	C	A
1587	A	A	A
1588	A		A
1589	A		A
1590	A	A	A
1594	A	A	-
1595	A	A	-
1596	A	A	-
1597	A	A	-
1598	A	A	-
1599	A	A	-
1600	A	A	-
1601	A	A	-
1602	A	A	A
1603	A	A	A
1604	A	A	A
1605	A	C	-
1606	A	A	-
1607	A	A	-
1608	A	A	-
1609	A	A	-

Table 4 (Cont'd)

No	Test Example 1	Test Example 2	Test Example 3
1610	A	A	-
1611	A		-
1612	A	A	-
1613	A	A	-
1614	A	C	A
1615	A	A	A
1617	A		A
1618	A	C	A
1619	A	A	-
1620	A		A
1622	A	A	A
1623	A	C	A
1624	A	D	A
1625	A	A	A
1626	A		A
1627	A	A	A
1628	A	A	A
1629	A	A	A
1632	A		A
1633	A	A	A
1634	A	A	A
1635	A	A	A
1636	A	D	A
1637	A	A	A

Table 4 (Cont'd)

	No	Test Example 1	Test Example 2	Test Example 3
5	1638	A	A	A
10	1639	A	A	A
15	1640	A	A	A
20	1641	A		A
25	1642	A	A	A
30	1643	A		A
35	1644	A	A	A
40	1645	A	A	A
45	1646	A	A	A
50	1647	A	A	A
	1648	A	A	A
	1649	A	A	A
	1650	A	A	A
	1651	A	A	A
	1652	A	A	A
	1653	A	A	A
	1654	A	A	A
	1655	A	A	A
	1656	A	A	A
	1658	A		
	1659	A		A
	1660	A	A	-
	1661	A		-
	1662	A	A	-

Table 4 (Cont'd)

	No	Test Example 1	Test Example 2	Test Example 3
5	1663	A	A	-
10	1664	A	A	-
15	1665	A	A	-
20	1666	A	A	-
25	1667	A	A	-
30	1668	A	A	-
35	1669	A	A	-
40	1670	A	A	-
45	1671	A	A	-
50	1672	A	A	-
	1673	A		-
	1674	A	A	-
	1679	A	A	A
	1680	A	A	A
	1681	A	A	A
	1682	A	A	-
	1683	A		-
	1684	A	A	-
	1685	A	A	-
	1686	A	A	-
	1689	A	A	-
	1690	A	A	-
	1691	A	A	-
	1692	A		-

Table 4 (Cont'd)

No	Test Example 1	Test Example 2	Test Example 3
1693	A	A	-
1694	A		-
1695	A	A	-
1696	A	A	-
1697	A	A	-
1698	A		-
1699	A	A	-
1700	A	D	-
1714	A	A	A
1715	A	A	A
1716	A	A	A
1717	A	A	A
1722	A	A	A
1723	A	A	A
1726	A		A
1727	A		A
1732	A	A	A
1733	A	A	A
1737	A	C	A
1742	A		A
1743	A		A
1747	A	C	A
1748	A		A
1750	A		A

Table 4 (Cont'd)

No	Test Example 1	Test Example 2	Test Example 3
1752	A		A
1763	A		A
1764	A	A	A
1765	A	A	A
1766	A	A	A
1767	A		
1768	A		A
1770	A	-	A
1772	A	-	A
1773	A	A	A
1774	A	-	A
1775	A	-	A
1776	A	-	A
1777	A	A	A
1778	A	-	A
1799	A	A	A
1800	A	A	A
1801	A	A	A
1802	A		
1803	A	A	A
1804	A		
1805	A		

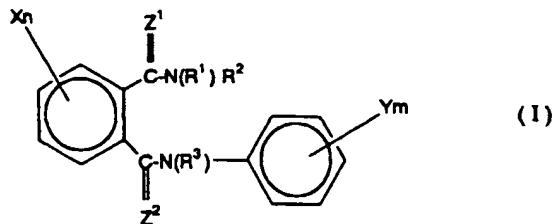
55 In Table 4, "-" means that test is not conducted.

Claims

1. A phthalic acid diamide derivative represented by the general formula (I).

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15 wherein R¹, R² and R³ may be the same or different, and are each a hydrogen atom, a cyano group, a C₃-C₆ cycloalkyl group, a halo-C₃-C₆ cycloalkyl group, a C₃-C₆ cycloalkenyl group, a halo-C₃-C₆ cycloalkenyl group or a group of the formula -A¹-Q₁ (wherein A¹ is -O-, -S-, -SO₂-, -C(=O)-, a group of the formula -N(R⁴)- (wherein R⁴ is a C₁-C₆ alkylcarbonyl group, a halo-C₁-C₆ alkylcarbonyl group, a C₁-C₆ alkoxy carbonyl group, a phenyl carbonyl group, or a substituted phenyl carbonyl group having at least one substituent which may be the same or different, and is selected from the group consisting of a halogen atom, a cyano group, a nitro group, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₂-C₆ alkenyl group, a halo-C₂-C₆ alkenyl group, a C₂-C₆ alkynyl group, a halo-C₂-C₆ alkynyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group, a halo-C₁-C₆ alkylsulfonyl group, a mono-C₁-C₆ alkylamino group and a di-C₁-C₆ alkylamino group which may be the same or different), a C₁-C₈ alkylene group, a C₃-C₆ alkenylene group or a C₃-C₆ alkynylene group;

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(1) when A¹ is -O- or a group of the formula -N(R⁴)- (wherein R⁴ is the same as defined above), then Q is a hydrogen atom, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₃-C₆ alkenyl group, a halo-C₃-C₆ alkenyl group, a C₃-C₆ alkynyl group, a phenyl group, a substituted phenyl group having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a cyano group, a nitro group, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₂-C₆ alkenyl group, a halo-C₂-C₆ alkenyl group, a C₂-C₆ alkynyl group, a halo-C₂-C₆ alkynyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group, a halo-C₁-C₆ alkylsulfonyl group, a mono-C₁-C₆ alkylamino group and a di-C₁-C₆ alkylamino group which may be the same or different, a C₁-C₄ alkyl group or a substituted phenyl-C₁-C₄ alkyl group having at least one substituent, in the phenyl ring, which may be the same or different and is selected from the group consisting of a halogen atom, a cyano group, a nitro group, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₂-C₆ alkenyl group, a halo-C₂-C₆ alkenyl group, a C₂-C₆ alkynyl group, a halo-C₂-C₆ alkynyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group, a halo-C₁-C₆ alkylsulfonyl group, a mono-C₁-C₆ alkylamino group and a di-C₁-C₆ alkylamino group which may be the same or different;

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(2) when A¹ is -S-, -SO₂- or -C(=O)-, then Q is a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₃-C₆ alkenyl group, a halo-C₃-C₆ alkenyl group, a C₃-C₆ alkynyl group, a C₁-C₆ alkoxy group, a mono-C₁-C₆ alkylamino group, a di-C₁-C₆ alkylamino group which may be the same or different, a C₁-C₆ alkoxy carbonylamino group, a C₁-C₆ alkoxy carbonyl-C₁-C₆ alkylamino group, a phenyl group, a substituted phenyl group having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a cyano group, a nitro group, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₂-C₆ alkenyl group, a halo-C₂-C₆ alkenyl group, a C₂-C₆ alkynyl group, a halo-C₂-C₆ alkynyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group, a halo-C₁-C₆ alkylsulfonyl group, a mono-C₁-C₆ alkylamino group and a di-C₁-C₆ alkylamino group which may be the same or different, a phenylamino group, a substituted phenylamino group having at least one substituent, in the phenyl ring, which may be the same or different and is selected from the group consisting of a halogen atom, a cyano group, a nitro group, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₂-C₆ alkenyl group, a halo-C₂-C₆ alkenyl group, a C₂-C₆ alkynyl group, a halo-C₂-C₆ alkynyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group, a halo-C₁-C₆ alkylsulfonyl group, a mono-C₁-C₆ alkylamino group and a di-C₁-C₆ alkylamino group which may be the same or different);

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be the same or different, a naphthyl group, a substituted naphthyl group having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a cyano group, a nitro group, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₂-C₆ alkenyl group, a halo-C₂-C₆ alkenyl group, a C₂-C₆ alkynyl group, a halo-C₂-C₆ alkynyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group, a halo-C₁-C₆ alkylsulfonyl group, a mono-C₁-C₆ alkylamino group and a di-C₁-C₆ alkylamino group which may be the same or different, a heterocyclic group (which means pyridyl group, pyridine-N-oxide group, pyrimidinyl group, furyl group, tetrahydrofuryl group, thiényl group, tetrahydrothienyl group, tetrahydropyranyl group, tetrahydrothiopyranyl group, oxazolyl group, isoxazolyl group, oxadiazolyl group, thiazolyl group, isothiazolyl group, thiadiazolyl group, imidazolyl group, triazolyl group or a pyrazolyl group), or a substituted heterocyclic group (wherein the heterocyclic group is the same as defined above) having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a cyano group, a nitro group, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₂-C₆ alkenyl group, a halo-C₂-C₆ alkenyl group, a C₂-C₆ alkynyl group, a halo-C₂-C₆ alkynyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group, a halo-C₁-C₆ alkylsulfonyl group, a mono-C₁-C₆ alkylamino group and a di-C₁-C₆ alkylamino group which may be the same or different.

(3) when A¹ is a C₁-C₈ alkylene group, a C₃-C₆ alkenylene group or a C₃-C₆ alkynylene group, then Q is a hydrogen atom, a halogen atom, a cyano group, a nitro group, a halo-C₁-C₆ alkyl group, a C₃-C₆ cycloalkyl group, a halo-C₃-C₆ cycloalkyl group, a C₁-C₆ alkoxy carbonyl group, a di-C₁-C₆ alkoxyphosphoryl group which may be the same or different, a di-C₁-C₆ alkoxythiophosphoryl group which may be the same or different, a diphenylphosphino group, a diphenylphosphono group, a phenyl group, a substituted phenyl group having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a cyano group, a nitro group, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₂-C₆ alkenyl group, a halo-C₂-C₆ alkenyl group, a C₂-C₆ alkynyl group, a halo-C₂-C₆ alkynyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group, a halo-C₁-C₆ alkylsulfonyl group, a mono-C₁-C₆ alkylamino group and a di-C₁-C₆ alkylamino group which may be the same or different, a naphthyl group, a substituted naphthyl group having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a cyano group, a nitro group, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₂-C₆ alkenyl group, a halo-C₂-C₆ alkenyl group, a C₂-C₆ alkynyl group, a halo-C₂-C₆ alkynyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group, a halo-C₁-C₆ alkylsulfonyl group, a mono-C₁-C₆ alkylamino group and a di-C₁-C₆ alkylamino group which may be the same or different, a heterocyclic group (which is the same as defined above), a substituted heterocyclic group (wherein the heterocyclic group is the same as defined above) having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a cyano group, a nitro group, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₂-C₆ alkenyl group, a halo-C₂-C₆ alkenyl group, a C₂-C₆ alkynyl group, a halo-C₂-C₆ alkynyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group, a halo-C₁-C₆ alkylsulfonyl group, a mono-C₁-C₆ alkylamino group and a di-C₁-C₆ alkylamino group which may be the same or different, or a group of the formula -Z³-R⁵ (wherein Z³ is -O-, -S-, -SO₂- or a group of the formula -N(R⁶)-(wherein R⁶ is a hydrogen atom, a C₁-C₆ alkylcarbonyl group, a halo-C₁-C₆ alkylcarbonyl group, a C₁-C₆ alkoxy carbonyl group, a phenyl carbonyl group, a substituted phenyl carbonyl group having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a cyano group, a nitro group, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₂-C₆ alkenyl group, a halo-C₂-C₆ alkenyl group, a C₂-C₆ alkynyl group, a halo-C₂-C₆ alkynyl group, a C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group, a halo-C₁-C₆ alkylsulfonyl group, a mono-C₁-C₆ alkylamino group and a di-C₁-C₆ alkylamino group which may be the same or different, a phenyl C₁-C₄ alkoxy carbonyl group, or a substituted phenyl C₁-C₄ alkoxy carbonyl group having at least one substituent, in the phenyl ring, which may be the same or different and is selected from the group consisting of a halogen atom, a cyano group, a nitro group, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₂-C₆ alkenyl group, a halo-C₂-C₆ alkenyl group, a C₂-C₆ alkynyl group, a halo-C₂-C₆ alkynyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group, a halo-C₁-C₆ alkylsulfonyl group, a mono-C₁-C₆ alkylamino group and a di-C₁-C₆ alkylamino group which may be the same or different); and

R⁵ is a hydrogen atom, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₃-C₆ alkenyl group, a halo-C₃-C₆

alkenyl group, a C₃-C₆ alkynyl group, a halo-C₃-C₆ alkynyl group, a C₁-C₆ cycloalkyl group, a halo-C₃-C₆ cycloalkyl group, a C₁-C₆ alkylcarbonyl group, a halo C₁-C₆ alkylcarbonyl group, a C₁-C₆ alkoxy carbonyl group, a phenyl group, a substituted phenyl group having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a cyano group, a nitro group, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₂-C₆ alkenyl group, a halo-C₂-C₆ alkenyl group, a C₂-C₆ alkynyl group, a halo-C₂-C₆ alkynyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group, a halo-C₁-C₆ alkylsulfonyl group, a mono-C₁-C₆ alkylamino group and a di-C₁-C₆ alkylamino group which may be the same or different, a phenyl C₁-C₄ alkyl group, a substituted phenyl C₁-C₄ alkyl group having at least one substituent, in the phenyl ring, which may be the same or different and is selected from the group consisting of a halogen atom, a cyano group, a nitro group, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₂-C₆ alkenyl group, a halo-C₂-C₆ alkenyl group, a C₂-C₆ alkynyl group, a halo-C₂-C₆ alkynyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group, a halo-C₁-C₆ alkylsulfonyl group, a mono-C₁-C₆ alkylamino group and a di-C₁-C₆ alkylamino group which may be the same or different, a naphthyl group, a substituted naphthyl group having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a cyano group, a nitro group, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₂-C₆ alkenyl group, a halo-C₂-C₆ alkenyl group, a C₂-C₆ alkynyl group, a halo-C₂-C₆ alkynyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group, a halo-C₁-C₆ alkylsulfonyl group, a mono-C₁-C₆ alkylamino group and a di-C₁-C₆ alkylamino group which may be the same or different, a heterocyclic group (which is the same as defined above), or a substituted heterocyclic group (wherein the heterocyclic group is the same as defined above) having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a cyano group, a nitro group, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₂-C₆ alkenyl group, a halo-C₂-C₆ alkenyl group, a C₂-C₆ alkynyl group, a halo-C₂-C₆ alkynyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group, a halo-C₁-C₆ alkylsulfonyl group, a mono-C₁-C₆ alkylamino group and a di-C₁-C₆ alkylamino group which may be the same or different);

(ℓ is an integer of 1 to 4); further

R^1 and R^2 may form a 4 to 7 membered ring by combining to each other, in which the ring may contain the same or different 1 to 3 hetero atoms selected from the group consisting of oxygen atom, sulfur atom and nitrogen atom:

X may be the same or different, and is a hydrogen atom, a halogen atom, a cyano group, a nitro group, a C₃-C₆ cycloalkyl group, a halo-C₃-C₆ cycloalkyl group, a phenyl group, a substituted phenyl group having at least one substituents which may be the same or different and is selected from the group consisting of a halogen atom, a cyano group, a nitro group, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₂-C₆ alkenyl group, a halo-C₂-C₆ alkenyl group, a C₂-C₆ alkynyl group, a halo-C₂-C₆ alkynyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfanyl group, a halo-C₁-C₆ alkylsulfanyl group, a C₁-C₆ alkylsulfonyl group, a halo-C₁-C₆ alkylsulfonyl group, a mono-C₁-C₆ alkylamino group and a di-C₁-C₆ alkylamino group which may be the same or different, a naphthyl group, a substituted naphthyl group having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a cyano group, a nitro group, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₂-C₆ alkenyl group, a halo-C₂-C₆ alkenyl group, a C₂-C₆ alkynyl group, a halo-C₂-C₆ alkynyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfanyl group, a halo-C₁-C₆ alkylsulfanyl group, a C₁-C₆ alkylsulfonyl group, a halo-C₁-C₆ alkylsulfonyl group, a mono-C₁-C₆ alkylamino group and a di-C₁-C₆ alkylamino group which may be the same or different, a heterocyclic group (which is the same as defined above), a substituted heterocyclic group (wherein the heterocyclic group is the same as defined above) having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a cyano group, a nitro group, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₂-C₆ alkenyl group, a halo-C₂-C₆ alkenyl group, a C₂-C₆ alkynyl group, a halo-C₂-C₆ alkynyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfanyl group, a halo-C₁-C₆ alkylsulfanyl group, a C₁-C₆ alkylsulfonyl group, a halo-C₁-C₆ alkylsulfonyl group, a mono-C₁-C₆ alkylamino group and a di-C₁-C₆ alkylamino group which may be the same or different, or a group of the formula -A²-R⁷ (wherein A² is -O-, -S-, -SO-, -SO₂-, -C(=O)-, -C(=NOR⁸)- (wherein R⁸ is a hydrogen atom, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₃-C₆ alkenyl group, a halo-C₃-C₆

alkenyl group, a C₃-C₆ alkynyl group, a C₃-C₆ cycloalkyl group, a phenyl-C₁-C₄ alkyl group, or a substituted phenyl-C₁-C₄ alkyl group having at least one substituent, in the phenyl ring, which may be the same or different and is selected from the group consisting of a halogen atom, a cyano group, a nitro group, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₂-C₆ alkenyl group, a halo-C₂-C₆ alkenyl group, a C₂-C₆ alkynyl group, a halo-C₂-C₆ alkynyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group, a halo-C₁-C₆ alkylsulfonyl group, a mono-C₁-C₆ alkylamino group and a di-C₁-C₆ alkylamino group which may be the same or different), a C₁-C₆ alkylene group, a halo-C₁-C₆ alkylene group, a C₂-C₆ alkenylene group, a halo-C₂-C₆ alkenylene group, a C₂-C₆ alkynylene group or a halo-C₃-C₆ alkynylene group;

(1) when A² is -O-, -S-, -SO- or -SO₂-, then R⁷ is a hydrogen atom, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₃-C₆ alkenyl group, a halo-C₃-C₆ alkenyl group, a C₃-C₆ alkynyl group, a C₃-C₆ cycloalkyl group, a halo-C₃-C₆ cycloalkyl group, a C₃-C₆ cycloalkenyl group, a halo-C₃-C₆ cycloalkenyl group, a di-C₁-C₆ alkoxyphosphoryl group which may be the same or different, a di-C₁-C₆ alkoxythiophosphoryl group which may be the same or different, a phenyl group, a substituted phenyl group having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a cyano group, a nitro group, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₂-C₆ alkenyl group, a halo-C₂-C₆ alkenyl group, a C₂-C₆ alkynyl group, a halo-C₂-C₆ alkynyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a mono-C₁-C₆ alkylamino group and a di-C₁-C₆ alkylamino group which may be the same or different, a naphthyl group, a substituted naphthyl group having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a cyano group, a nitro group, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₂-C₆ alkenyl group, a halo-C₂-C₆ alkenyl group, a C₂-C₆ alkynyl group, a halo-C₂-C₆ alkynyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group, a halo-C₁-C₆ alkylsulfonyl group, a mono-C₁-C₆ alkylamino group and a di-C₁-C₆ alkylamino group which may be the same or different, a heterocyclic group (which is the same as defined above), a substituted heterocyclic group (wherein the heterocyclic group is the same as defined above) having at least one substituents which may be the same or different and are selected from the group consisting of a halogen atom, a cyano group, a nitro group, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₂-C₆ alkenyl group, a halo-C₂-C₆ alkenyl group, a C₂-C₆ alkynyl group, a halo-C₂-C₆ alkynyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group, a halo-C₁-C₆ alkylsulfonyl group, a mono-C₁-C₆ alkylamino group and a di-C₁-C₆ alkylamino group which may be the same or different, or a group of the formula -A³-R⁹ (wherein A³ is -C(=O)-, -SO₂-, a C₁-C₆ alkylene group, a halo-C₁-C₆ alkylene group, a C₂-C₆ alkenylene group, a halo-C₂-C₆ alkenylene group, a C₃-C₆ alkynylene group, or a halo-C₃-C₆ alkynylene group,

(i) when A³ is -C(=O)- or -SO₂-, then R⁹ is a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₁-C₆ alkoxy group, a mono-C₁-C₆ alkylamino group, a di-C₁-C₆ alkylamino group which may be the same or different, a phenyl group, a substituted phenyl group having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a cyano group, a nitro group, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₂-C₆ alkenyl group, a halo-C₂-C₆ alkenyl group, a C₂-C₆ alkynyl group, a halo-C₂-C₆ alkynyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group, a halo-C₁-C₆ alkylsulfonyl group, a mono-C₁-C₆ alkylamino group and a di-C₁-C₆ alkylamino group which may be the same or different, a naphthyl group, a substituted naphthyl group having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a cyano group, a nitro group, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₂-C₆ alkenyl group, a halo-C₂-C₆ alkenyl group, a C₂-C₆ alkynyl group, a halo-C₂-C₆ alkynyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group, a halo-C₁-C₆ alkylsulfonyl group, a mono-C₁-C₆ alkylamino group and a di-C₁-C₆ alkylamino group which may be the same or different, a heterocyclic group (which is the same as defined above), or a sub-

halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group, a halo-C₁-C₆ alkylsulfonyl group, a mono-C₁-C₆ alkylamino group and a di-C₁-C₆ alkylamino group which may be the same or different, a heterocyclic group (which is the same as defined the above), or a substituted heterocyclic group (wherein the heterocyclic group is the same as defined the above) having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a cyano group, a nitro group, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₂-C₆ alkenyl group, a halo-C₂-C₆ alkenyl group, a C₂-C₆ alkynyl group, a halo-C₂-C₆ alkynyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group, a halo-C₁-C₆ alkylsulfonyl group, a mono-C₁-C₆ alkylamino group and a di-C₁-C₆ alkylamino group which may be the same or different));

(2) when A² is -C(=O)- or a group of the formula -C(=NOR⁸)-(wherein R⁸ is the same as defined above), then R⁷ is a C₁-C₆ alkyl group, a halo C₁-C₆ alkyl group, a C₂-C₆ alkenyl group, a halo-C₂-C₆ alkenyl group, a C₃-C₆ cycloalkyl group, a halo-C₃-C₆ cycloalkyl group, a C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a mono-C₁-C₆ alkylamino group, a di-C₁-C₆ alkylamino group which may be the same or different, a phenyl group, a substituted phenyl group having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a cyano group, a nitro group, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₂-C₆ alkenyl group, a halo-C₂-C₆ alkenyl group, a C₂-C₆ alkynyl group, a halo-C₂-C₆ alkynyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group, a halo-C₁-C₆ alkylsulfonyl group, a mono-C₁-C₆ alkylamino group and a di-C₁-C₆ alkylamino group which may be the same or different, a phenylamino group, a substituted phenylamino group having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a cyano group, a nitro group, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₂-C₆ alkenyl group, a halo-C₂-C₆ alkenyl group, a C₂-C₆ alkynyl group, a halo-C₂-C₆ alkynyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group, a halo-C₁-C₆ alkylsulfonyl group, a mono-C₁-C₆ alkylamino group and a di-C₁-C₆ alkylamino group which may be the same or different, a naphthyl group, a substituted naphthyl group having one or more substituents which may be the same or different and are selected from the group consisting of a halogen atom, a cyano group, a nitro group, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₂-C₆ alkenyl group, a halo-C₂-C₆ alkenyl group, a C₂-C₆ alkynyl group, a halo-C₂-C₆ alkynyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group, a halo-C₁-C₆ alkylsulfonyl group, a mono-C₁-C₆ alkylamino group and a di-C₁-C₆ alkylamino group which may be the same or different, a heterocyclic group (which is the same as defined above), or a substituted heterocyclic group (wherein the heterocyclic group is the same as defined above) having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a cyano group, a nitro group, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₂-C₆ alkenyl group, a halo-C₂-C₆ alkenyl group, a C₂-C₆ alkynyl group, a halo-C₂-C₆ alkynyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group, a halo-C₁-C₆ alkylsulfonyl group, a mono-C₁-C₆ alkylamino group and a di-C₁-C₆ alkylamino group which may be the same or different,

(3) when A^2 is a C_1 - C_6 alkylene group, a halo- C_1 - C_6 alkylene group, C_2 - C_6 alkenylene group, a halo- C_2 - C_6 alkenylene group, a C_2 - C_6 alkynylene group or a halo- C_3 - C_6 alkynylene group, then R^7 is a hydrogen atom, a halogen atom, a C_3 - C_6 cycloalkyl group, a halo- C_3 - C_6 cycloalkyl group, a C_1 - C_6 alkoxy carbonyl group, a phenyl group, a substituted phenyl group having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a cyano group, a nitro group, a C_1 - C_6 alkyl group, a halo- C_1 - C_6 alkyl group, a C_2 - C_6 alkenyl group, a halo- C_2 - C_6 alkenyl group, a C_2 - C_6 alkynyl group, a halo- C_2 - C_6 alkynyl group, a C_1 - C_6 alkoxy group, a halo- C_1 - C_6 alkoxy group, a C_1 - C_6 alkylthio group, a halo- C_1 - C_6 alkylthio group, a C_1 - C_6 alkylsulfinyl group, a halo- C_1 - C_6 alkylsulfinyl group, a C_1 - C_6 alkylsulfonyl group, a halo- C_1 - C_6 alkylsulfonyl group, a mono- C_1 - C_6 alkylamino group and a di- C_1 - C_6 alkylamino group which may be the same or different, a naphthyl group, a substituted naphthyl group having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a cyano group, a nitro group,

C₁-C₆ alkylamino group and a di-C₁-C₆ alkylamino group which may be the same or different, or a group of the formula -A⁶-R¹⁴ (wherein A⁶ is -C(=O)-, -SO₂-, a C₁-C₆ alkylene group, a halo-C₁-C₆ alkylene group, a C₂-C₆ alkenylene group, a halo-C₂-C₆ alkenylene group, a C₂-C₆ alkynylene group or a halo-C₃-C₆ alkynylene group;

- 5 (i) when A⁶ is -C(=O)- or -SO₂-, then R¹⁴ is a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a phenyl group, a substituted phenyl group having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a cyano group, a nitro group, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₂-C₆ alkenyl group, a halo-C₂-C₆ alkenyl group, a C₂-C₆ alkynyl group, a halo-C₂-C₆ alkynyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group, a halo-C₁-C₆ alkylsulfonyl group, a mono-C₁-C₆ alkylamino group and a di-C₁-C₆ alkylamino group which may be the same or different, a naphthyl group, a substituted naphthyl group having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a cyano group, a nitro group, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₂-C₆ alkenyl group, a halo-C₂-C₆ alkenyl group, a C₂-C₆ alkynyl group, a halo-C₂-C₆ alkynyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group, a halo-C₁-C₆ alkylsulfonyl group, a mono-C₁-C₆ alkylamino group and a di-C₁-C₆ alkylamino group which may be the same or different, a heterocyclic group (which is the same as defined above), or a substituted heterocyclic group (wherein the heterocyclic group is the same as defined above) having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a cyano group, a nitro group, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₂-C₆ alkenyl group, a halo-C₂-C₆ alkenyl group, a C₂-C₆ alkynyl group, a halo-C₂-C₆ alkynyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group, a halo-C₁-C₆ alkylsulfonyl group, a mono-C₁-C₆ alkylamino group and a di-C₁-C₆ alkylamino group which may be the same or different;
- 10 (ii) when A⁶ is a C₁-C₆ alkylene group, a halo-C₁-C₆ alkylene group, a C₂-C₆ alkenylene group, a halo-C₂-C₆ alkenylene group, a C₂-C₆ alkynylene group or a halo-C₃-C₆ alkynylene group, then R¹⁴ is a hydrogen atom, a halogen atom, a cyano group, a C₃-C₆ cycloalkyl group, a halo-C₃-C₆ cycloalkyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group, a halo-C₁-C₆ alkylsulfonyl group, a C₁-C₆ alkylcarbonyl group, a halo-C₁-C₆ alkylcarbonyl group, a C₁-C₆ alkoxy carbonyl group, a phenyl group, a substituted phenyl group having at least one substituent which may be the same or different and are selected from the group consisting of a halogen atom, a cyano group, a nitro group, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₂-C₆ alkenyl group, a halo-C₂-C₆ alkenyl group, a C₂-C₆ alkynyl group, a halo-C₂-C₆ alkynyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group, a halo-C₁-C₆ alkylsulfonyl group, a mono-C₁-C₆ alkylamino group and a di-C₁-C₆ alkylamino group which may be the same or different, a phenoxy group, a substituted phenoxy group having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a cyano group, a nitro group, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₂-C₆ alkenyl group, a halo-C₂-C₆ alkenyl group, a C₂-C₆ alkynyl group, a halo-C₂-C₆ alkynyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group, a halo-C₁-C₆ alkylsulfonyl group, a mono-C₁-C₆ alkylamino group and a di-C₁-C₆ alkylamino group which may be the same or different, a phenylthio group, a substituted phenylthio group having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a cyano group, a nitro group, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₂-C₆ alkenyl group, a halo-C₂-C₆ alkenyl group, a C₂-C₆ alkynyl group, a halo-C₂-C₆ alkynyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group, a halo-C₁-C₆ alkylsulfonyl group, a mono-C₁-C₆ alkylamino group and a di-C₁-C₆ alkylamino group which may be the same or different, a naphthyl group, a substituted naphthyl group having at least one substituent which may be the same or different;
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- 50
- 55

ferent and is selected from the group consisting of a halogen atom, a cyano group, a nitro group, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₂-C₆ alkenyl group, a halo-C₂-C₆ alkenyl group, a C₂-C₆ alkynyl group, a halo-C₂-C₆ alkynyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group, a halo-C₁-C₆ alkylsulfonyl group, a mono-C₁-C₆ alkylamino group and a di-C₁-C₆ alkylamino group which may be the same or different, a heterocyclic group (which is the same as defined above), or a substituted heterocyclic group (wherein the heterocyclic group is the same as defined above) having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a cyano group, a nitro group, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₂-C₆ alkenyl group, a halo-C₂-C₆ alkenyl group, a C₂-C₆ alkynyl group, a halo-C₂-C₆ alkynyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group, a halo-C₁-C₆ alkylsulfonyl group, a mono-C₁-C₆ alkylamino group and a di-C₁-C₆ alkylamino group which may be the same or different));

n is an integer of 1 to 4;

further, X may form a condensed ring (which means naphthalene, tetrahydronaphthalene, indene, indane, quinoline, quinazoline, chroman, isochroman, indole, indoline, benzodioxane, benzodioxole, benzofuran, dihydrobenzofuran, benzothiophene, dihydrobenzothiophene, benzoxazole, benzothiazole, benzimidazole or indazole), by combining together with the adjacent carbon atoms in the phenyl ring, and said condensed ring may have at least one substituents, which may be the same or different, and selected from the group consisting of a halogen atom, a cyano group, a nitro group, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₂-C₆ alkenyl group, a halo-C₂-C₆ alkenyl group, a C₂-C₆ alkynyl group, a halo-C₂-C₆ alkynyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group, a halo-C₁-C₆ alkylsulfonyl group, a mono-C₁-C₆ alkylamino group, a di-C₁-C₆ alkylamino group which may be the same or different, a phenyl group, a substituted phenyl group having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a cyano group, a nitro group, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₂-C₆ alkenyl group, a halo-C₂-C₆ alkenyl group, a C₂-C₆ alkynyl group, a halo-C₂-C₆ alkynyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group, a halo-C₁-C₆ alkylsulfonyl group, a mono-C₁-C₆ alkylamino group and a di-C₁-C₆ alkylamino group which may be the same or different, a naphthyl group, a substituted naphthyl group having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a cyano group, a nitro group, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₂-C₆ alkenyl group, a halo-C₂-C₆ alkenyl group, a C₂-C₆ alkynyl group, a halo-C₂-C₆ alkynyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group, a halo-C₁-C₆ alkylsulfonyl group, a mono-C₁-C₆ alkylamino group and a di-C₁-C₆ alkylamino group which may be the same or different, a heterocyclic group (which is the same as defined above), and a substituted heterocyclic group (wherein the heterocyclic group is the same as defined above) having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a cyano group, a nitro group, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₂-C₆ alkenyl group, a halo-C₂-C₆ alkenyl group, a C₂-C₆ alkynyl group, a halo-C₂-C₆ alkynyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group, a halo-C₁-C₆ alkylsulfonyl group, a mono-C₁-C₆ alkylamino group and a di-C₁-C₆ alkylamino group which may be the same or different; Y is the same or different, and is a hydrogen atom, a halogen atom, a cyano group, a nitro group, a C₃-C₆ cycloalkyl group, a halo-C₃-C₆ cycloalkyl group, a di-C₁-C₆ alkoxyphosphoryl group which may be the same or different, a di-C₁-C₆ alkoxythiophosphoryl group which may be the same or different, a phenyl group, a substituted phenyl group having at least one substituent which may be the same or different and is selected from the group consisting of a hal-

ogen atom, a cyano group, a nitro group, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₂-C₆ alkenyl group, a halo-C₂-C₆ alkenyl group, a C₂-C₆ alkynyl group, a halo-C₂-C₆ alkynyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group, a halo-C₁-C₆ alkylsulfonyl group, a mono-C₁-C₆ alkylamino group and a di-C₁-C₆ alkylamino group which may be the same or different, a naphthyl group, a substituted naphthyl group having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a cyano group, a nitro group, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₂-C₆ alkenyl group, a halo-C₂-C₆ alkenyl group, a C₂-C₆ alkynyl group, a halo-C₂-C₆ alkynyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group, a halo-C₁-C₆ alkylsulfonyl group, a mono-C₁-C₆ alkylamino group and a di-C₁-C₆ alkylamino group which may be the same or different, a heterocyclic group (which is the same as defined above), a substituted heterocyclic group (wherein the heterocyclic group is the same as defined above) having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a cyano group, a nitro group, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₂-C₆ alkenyl group, a halo-C₂-C₆ alkenyl group, a C₂-C₆ alkynyl group, a halo-C₂-C₆ alkynyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group, a halo-C₁-C₆ alkylsulfonyl group, a mono-C₁-C₆ alkylamino group and a di-C₁-C₆ alkylamino group which may be the same or different, or a group of the formula -A²-R⁷ (wherein A² and R⁷ are the same as defined above);

m is an integer of 1 to 5;

further, Y may form a condensed ring (the condensed ring is the same as defined above), by combining together with the adjacent carbon atoms in the phenyl ring, said condensed ring may have at least one substituents, which may be the same or different, and selected from the group consisting of a halogen atom, a cyano group, a nitro group, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₂-C₆ alkenyl group, a halo-C₂-C₆ alkenyl group, a C₂-C₆ alkynyl group, a halo-C₂-C₆ alkynyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group, a halo-C₁-C₆ alkylsulfonyl group, a mono-C₁-C₆ alkylamino group, a di-C₁-C₆ alkylamino group which may be the same or different, a phenyl group, a substituted phenyl group having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a cyano group, a nitro group, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₂-C₆ alkenyl group, a halo-C₂-C₆ alkenyl group, a C₂-C₆ alkynyl group, a halo-C₂-C₆ alkynyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group, a halo-C₁-C₆ alkylsulfonyl group, a mono-C₁-C₆ alkylamino group and a di-C₁-C₆ alkylamino group which may be the same or different, a naphthyl group, a substituted naphthyl group having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a cyano group, a nitro group, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₂-C₆ alkenyl group, a halo-C₂-C₆ alkenyl group, a C₂-C₆ alkynyl group, a halo-C₂-C₆ alkynyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group, a halo-C₁-C₆ alkylsulfonyl group, a mono-C₁-C₆ alkylamino group and a di-C₁-C₆ alkylamino group which may be the same or different, a heterocyclic group (which is the same as defined above), and a substituted heterocyclic group (wherein said heterocyclic group is the same as defined above) having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a cyano group, a nitro group, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₂-C₆ alkenyl group, a halo-C₂-C₆ alkenyl group, a C₂-C₆ alkynyl group, a halo-C₂-C₆ alkynyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group, a halo-C₁-C₆ alkylsulfonyl group, a mono-C₁-C₆ alkylamino group and a di-C₁-C₆ alkylamino group which may be the same or different;

Z^1 and Z^2 are each represents an oxygen atom or a sulfur atom; provided that,

(1) when X, R¹ and R³ are hydrogen atoms at the same time; m is an integer of 2; Y at 2-position is a fluorine atom and Y at 3-position is a chlorine atom; then R² is not ethyl group, isopropyl group, cyclohexyl group, 2-propenyl group, methylthiopropyl group and α-methylbenzyl group.

5 (2) when X and R³ are hydrogen atoms at the same time; m is an integer of 2; Y at 2-position is a fluorine atom and Y at 3-position is a chlorine atom; then the 4 to 7 membered ring by combining R¹ and R² to each other, in which the ring may contain the same or different 1 to 3 hetero atoms selected from the group consisting of oxygen atom, sulfur atom and nitrogen atom is not morpholino group.

10 (3) when X, R¹ and R³ are hydrogen atoms at the same time; and R² is 1,2,2-trimethylpropyl group; then Y is not a hydrogen atom,

(4) when X, R¹ and R³ are hydrogen atoms at the same time; R² is 2,2-dimethylpropyl group; and m is an integer of 1; then Y is not 2-ethoxy group, and

15 (5) when X, R¹ and R³ are hydrogen atoms at the same time; and R² is *tert*-butyl group group; and m is an integer of 1; then Y is not 4-chlorine atom, 2-nitro group, 4-nitro group, 3-methoxy group, 4-methoxy group and 2,6-dimethyl groups.

2. The phthalic acid diamide derivative according to Claim 1, wherein R¹, R² and R³ may be the same or different, and are each a hydrogen atom, a C₃-C₆ cycloalkyl group, a halo-C₃-C₆ cycloalkyl group, or a group of the formula -A¹-Q₂ (wherein A¹ is a C₁-C₈ alkylene group, a C₃-C₆ alkenylene group or a C₃-C₆ alkynylene group; and Q is a hydrogen atom, a halogen atom, a cyano group, a nitro group, a halo-C₁-C₆ alkyl group, a C₃-C₆ cycloalkyl group, a halo-C₃-C₆ cycloalkyl group, a C₁-C₆ alkoxy carbonyl group, a di-C₁-C₆ alkoxyphosphoryl group which may be the same or different, a di-C₁-C₆ alkoxythiophosphoryl group which may be the same or different, a diphenylphosphino group, a diphenylphosphono group, a phenyl group, a substituted phenyl group having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfanyl group, a halo-C₁-C₆ alkylsulfanyl group, a C₁-C₆ alkylsulfonyl group and a halo-C₁-C₆ alkylsulfonyl group, a heterocyclic group (which means pyridyl group, pyridine-N-oxide group, pyrimidinyl group, furyl group, tetrahydrofuryl group, thieryl group, tetrahydrothienyl group, tetrahydropyran group, tetrahydrothiopyran group, oxazolyl group, isoxazolyl group, oxadiazolyl group, thiazolyl group, isothiazolyl group, thiadiazolyl group, imidazolyl group, triazolyl group or pyrazolyl group), a substituted heterocyclic group (wherein the heterocyclic group is the same as defined above) having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfanyl group, a halo-C₁-C₆ alkylsulfanyl group, a C₁-C₆ alkylsulfonyl group and a halo-C₁-C₆ alkylsulfonyl group, or a group of the formula -Z³-R⁵ (wherein Z³ is -O-, -S-, -SO₂- or a group of the formula -N(R⁶)- (wherein R⁶ is a hydrogen atom, a C₁-C₆ alkylcarbonyl group, a halo-C₁-C₆ alkylcarbonyl group, a C₁-C₆ alkoxy carbonyl group, a phenyl carbonyl group, a substituted phenyl carbonyl group having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfanyl group, a halo-C₁-C₆ alkylsulfanyl group, a C₁-C₆ alkylsulfonyl group and a halo-C₁-C₆ alkylsulfonyl group, a phenyl C₁-C₄ alkoxy carbonyl group, or a substituted phenyl C₁-C₄ alkoxy carbonyl group having at least one substituent, in the phenyl ring, which may be the same or different and is selected from the group consisting of a halogen atom, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfanyl group, a halo-C₁-C₆ alkylsulfanyl group, a C₁-C₆ alkylsulfonyl group and a halo-C₁-C₆ alkylsulfonyl group); and

R⁵ is a hydrogen atom, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₃-C₆ alkenyl group, a halo-C₃-C₆ alkenyl group, a C₃-C₆ alkynyl group, a halo-C₃-C₆ alkynyl group, a C₃-C₆ cycloalkyl group, a halo-C₃-C₆ cycloalkyl group, a C₁-C₆ alkylcarbonyl group, a halo-C₁-C₆ alkylcarbonyl group, a C₁-C₆ alkoxy carbonyl group, a phenyl group, a substituted phenyl group having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfanyl group, a halo-C₁-C₆ alkylsulfanyl group, a C₁-C₆ alkylsulfonyl group and a halo-C₁-C₆ alkylsulfonyl group, a phenyl C₁-C₄ alkyl group, a substituted phenyl C₁-C₄ alkyl group having at least one substituent, in the phenyl ring, which may be the same or different and is selected from the group consisting of a halogen atom, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfanyl group, a halo-C₁-C₆ alkylsulfanyl group, a C₁-C₆ alkylsulfonyl group and a halo-C₁-C₆ alkylsulfonyl group, a heterocyclic group (which is the same as defined above), or a substituted heterocyclic group (wherein

the heterocyclic group is the same as defined above) having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group and a halo-C₁-C₆ alkylsulfonyl group); and ℓ is an integer of 1 to 4;

R^1 and R^2 may form a 4 to 7 membered ring by combining to each other, in which the ring may contain the same or different 1 to 3 hetero atoms selected from the group consisting of oxygen atom, sulfur atom and nitrogen atom;

10 X may be the same or different, and is a hydrogen atom, a halogen atom, a cyano group, a nitro group, a C₃-C₆ cycloalkyl group, a halo-C₃-C₆ cycloalkyl group, a phenyl group, a substituted phenyl group having at least one substituents which may be the same or different and is selected from the group consisting of a halogen atom, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfanyl group, a halo-C₁-C₆ alkylsulfanyl group, a C₁-C₆ alkylsulfonyl group and a halo-C₁-C₆ alkylsulfonyl group, a heterocyclic group (which is the same as defined above), a substituted heterocyclic group (wherein the heterocyclic group is the same as defined above) having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfanyl group, a halo-C₁-C₆ alkylsulfanyl group, a C₁-C₆ alkylsulfonyl group, a halo-C₁-C₆ alkylsulfonyl group, or a group of the formula A²-R⁷ (wherein A² is -O-, -S-, -SO₂-, -C(=O)-, -C(=NOR⁸)-(wherein R⁸ is a hydrogen atom, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₃-C₆ alkenyl group, a halo-C₃-C₆ alkenyl group, a C₃-C₆ alkynyl group, a C₃-C₆ cycloalkyl group, a phenyl-C₁-C₄ alkyl group, or a substituted phenyl-C₁-C₄ alkyl group having at least one substituent, in the phenyl ring, which may be the same or different and is selected from the group consisting of a halogen atom, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfanyl group, a halo-C₁-C₆ alkylsulfanyl group and a halo-C₁-C₆ alkylsulfonyl group), a C₁-C₆ alkylene group, a halo-C₁-C₆ alkylene group, a C₂-C₆ alkenylene group, a halo-C₂-C₆ alkenylene group, a C₂-C₆ alkynylene group or a halo-C₃-C₆ alkynylene group;

group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group and a halo-C₁-C₆ alkylsulfonyl group);

(2) when A² is -C(=O)- or a group of the formula -C(=NOR⁸)-(wherein R⁸ is the same as defined the above), then R⁷ is a C₁-C₆ alkyl group, a halo C₁-C₆ alkyl group, a C₂-C₆ alkenyl group, a halo-C₂-C₆ alkenyl group, a C₃-C₆ cycloalkyl group, a halo-C₃-C₆ cycloalkyl group, a C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a mono-C₁-C₆ alkylamino group, a di-C₁-C₆ alkylamino group which may be the same or different, a phenyl group, a substituted phenyl group having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfanyl group, a halo-C₁-C₆ alkylsulfanyl group, a C₁-C₆ alkylsulfonyl group and a halo-C₁-C₆ alkylsulfonyl group, a phenylamino group, a substituted phenylamino group having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfanyl group, a halo-C₁-C₆ alkylsulfanyl group, a C₁-C₆ alkylsulfonyl group, and a halo-C₁-C₆ alkylsulfonyl group, a heterocyclic group (which is the same as defined the above), or a substituted heterocyclic group (wherein the heterocyclic group is the same as defined the above) having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfanyl group, a halo-C₁-C₆ alkylsulfanyl group, a C₁-C₆ alkylsulfonyl group and a halo-C₁-C₆ alkylsulfonyl group,

C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group and a halo-C₁-C₆ alkylsulfonyl group, a phenylthio group, a substituted phenylthio group having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group and a halo-C₁-C₆ alkylsulfonyl group, a heterocyclic group (which is the same as defined above), or a substituted heterocyclic group (wherein the heterocyclic ring is the same as defined above) having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group and a halo-C₁-C₆ alkylsulfonyl group));

n is an integer of 1 to 4;

further, X may form a condensed ring (which means naphthalene, tetrahydronaphthalene, indene, indane, quinoline, quinazoline, chroman, isochroman, indole, indoline, benzodioxane, benzodioxole, benzofuran, dihydrobenzofuran, benzothiophene, dihydrobenzothiophene, benzoxazole, benzothiazole, benzimidazole or indazole), by combining together with the adjacent carbon atoms in the phenyl ring, said condensed ring may have at least one substituent, which may be the same or different, and is selected from the group consisting of a halogen atom, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group, a halo-C₁-C₆ alkylsulfonyl group, a phenyl group, a substituted phenyl group having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group and a halo-C₁-C₆ alkylsulfonyl group, a heterocyclic group (which is the same as defined above), and a substituted heterocyclic group (wherein the heterocyclic group is the same as defined above) having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group and a halo-C₁-C₆ alkylsulfonyl group;

Y is the same or different, and is a hydrogen atom, a halogen atom, a cyano group, a nitro group, a halo-C₃-C₆cycloalkyl group, a phenyl group, a substituted phenyl group having at least one substituent which may be the

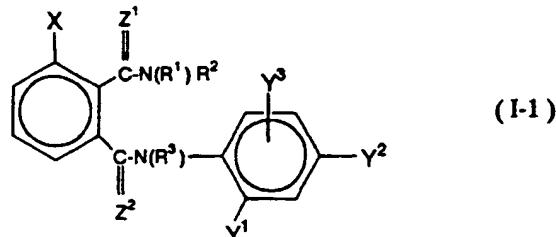
same or different and is selected from the group consisting of a halogen atom, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group and a halo-C₁-C₆ alkylsulfonyl group, a heterocyclic group (which is the same as defined above), a substituted heterocyclic group (wherein the heterocyclic group is the same as defined above) having at least one substituent,

which may be the same or different and is selected from the group consisting of a halogen atom, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group and a halo-C₁-C₆ alkylsulfonyl group, or a group of the formula -A²-R⁷ (wherein A² and R⁷ are the same as defined above);

m is an integer of 1 to 5;

C_1-C_6 alkylsulfonyl group and a halo- C_1-C_6 alkylsulfonyl group; and Z^1 and Z^2 are each represents an oxygen atom or a sulfur atom.

3. The phthalic acid diamide derivative according to Claim 2, represented by the general formula (I-1).



C_6 alkyl group, a C_1 - C_6 alkoxy group, a halo- C_1 - C_6 alkoxy group, a C_1 - C_6 alkylthio group, a halo- C_1 - C_6 alkylthio group, a C_1 - C_6 alkylsulfinyl group, a halo- C_1 - C_6 alkylsulfinyl group, a C_1 - C_6 alkylsulfonyl group and a halo- C_1 - C_6 alkylsulfonyl group); and ℓ is an integer of 1 to 4); further,

5 R^1 and R^2 may form a 4 to 7 membered ring by combining to each other, in which the ring may contain the same or different 1 to 3 hetero atoms selected from the group consisting of oxygen atom, sulfur atom and nitrogen atom;
 X is a hydrogen atom or a nitro group;

10 Y^1 and Y^3 may be the same or different and are each a hydrogen atom, a halogen atom, a C_1 - C_6 alkyl group, a halo- C_1 - C_6 alkyl group, a C_1 - C_6 alkoxy group, a halo- C_1 - C_6 alkoxy group, a C_1 - C_6 alkylthio group, a halo- C_1 - C_6 alkylthio group, a phenoxy group, a substituted phenoxy group having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a C_1 - C_6 alkyl group, a halo- C_1 - C_6 alkyl group, a C_1 - C_6 alkoxy group, a halo- C_1 - C_6 alkoxy group, a C_1 - C_6 alkylthio group, a halo- C_1 - C_6 alkylthio group, a C_1 - C_6 alkylsulfinyl group, a halo- C_1 - C_6 alkylsulfinyl group, a C_1 - C_6 alkylsulfonyl group and a halo- C_1 - C_6 alkylsulfonyl group, a pyridyloxy group, a substituted pyridyloxy group having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a halo- C_1 - C_6 alkyl group, a halo- C_1 - C_6 alkoxy group, a halo- C_1 - C_6 alkylthio group, a halo- C_1 - C_6 alkylsulfinyl group and a halo- C_1 - C_6 alkylsulfonyl group;

15 Y^2 is a halo- C_3 - C_6 cycloalkyl group, a phenyl group, a substituted phenyl group having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a halo- C_1 - C_6 alkyl group, a halo- C_1 - C_6 alkoxy group, a halo- C_2 - C_6 alkylthio group, a halo- C_1 - C_6 alkylsulfinyl group and a halo- C_1 - C_6 alkylsulfonyl group, a heterocyclic group (which is the same as defined above), a substituted heterocyclic group (wherein the heterocyclic group is the same as defined above) having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a halo- C_1 - C_6 alkyl group, a halo- C_1 - C_6 alkoxy group, a halo- C_1 - C_6 alkylthio group, a halo- C_1 - C_6 alkylsulfinyl group and a halo- C_1 - C_6 alkylsulfonyl group, or a group of the formula $-A^2-R^7$ (wherein A^2 is $-O-$, $-S-$, $-SO-$, $-SO_2-$, a halo- C_1 - C_6 alkylene group, a C_2 - C_6 alkenylene group, a halo- C_2 - C_6 alkenylene group, a C_2 - C_6 alkynylene group or a halo- C_3 - C_6 alkynylene group and,

20 (1) when A^2 is $-O-$, $-S-$, $-SO-$ or $-SO_2-$, then R^7 is a halo- C_3 - C_6 cycloalkyl group, a halo- C_3 - C_6 cycloalkenyl group, a substituted phenyl group having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a halo- C_1 - C_6 alkyl group, a halo- C_1 - C_6 alkoxy group, a halo- C_1 - C_6 alkylthio group, a halo- C_1 - C_6 alkylsulfinyl group and a halo- C_1 - C_6 alkylsulfonyl group, a heterocyclic group (which is the same as defined above), a substituted heterocyclic group (wherein the heterocyclic ring is the same as defined above) having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a halo- C_1 - C_6 alkyl group, a halo- C_1 - C_6 alkoxy group, a halo- C_1 - C_6 alkylthio group, a halo- C_1 - C_6 alkylsulfinyl group and a halo- C_1 - C_6 alkylsulfonyl group, or a group of the formula $-A^3-R^9$ (wherein A^3 is a halo- C_1 - C_6 alkylene group, a halo- C_3 - C_6 alkenylene group, a C_3 - C_6 alkynylene group or a halo- C_3 - C_6 alkynylene group; and R^9 is a hydrogen atom, a halogen atom, a phenyl group, a substituted phenyl group having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a halo- C_1 - C_6 alkyl group, a halo- C_1 - C_6 alkoxy group, a halo- C_1 - C_6 alkylthio group, a halo- C_1 - C_6 alkylsulfinyl group and a halo- C_1 - C_6 alkylsulfonyl group or a group of the formula $-A^4-R^{10}$ (wherein A^4 is $-O-$, $-S-$ or $-SO_2-$; and

25 R^{10} is a C_1 - C_6 alkyl group, a halo- C_1 - C_6 alkyl group, a C_3 - C_6 alkenyl group, a halo- C_3 - C_6 alkenyl group, a C_3 - C_6 cycloalkyl group, a halo- C_3 - C_6 cycloalkyl group, a phenyl group, a substituted phenyl group having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a halo- C_1 - C_6 alkyl group, a halo- C_1 - C_6 alkoxy group, a halo- C_1 - C_6 alkylthio group, a halo- C_1 - C_6 alkylsulfinyl group and a halo- C_1 - C_6 alkylsulfonyl group, a heterocyclic group (which is the same as defined above), a substituted heterocyclic group (wherein the heterocyclic ring is the same as defined above) having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a halo- C_1 - C_6 alkyl group, a halo- C_1 - C_6 alkoxy group, a halo- C_1 - C_6 alkylthio group, a halo- C_1 - C_6 alkylsulfinyl group and a halo- C_1 - C_6 alkylsulfonyl group and a halo- C_1 - C_6 alkylsulfonyl group));

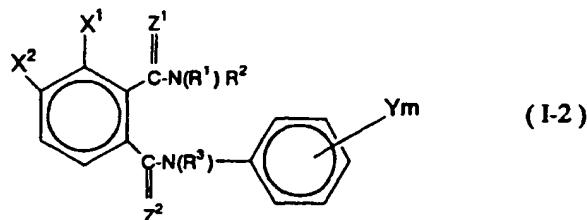
30 (2) when A^2 is a halo- C_1 - C_6 alkylene group, a C_2 - C_6 alkenylene group, a halo- C_2 - C_6 alkenylene group, a C_2 - C_6 alkynylene group or a halo- C_3 - C_6 alkynylene group, then R^7 is a hydrogen atom, a halogen atom, a halo- C_3 - C_6 cycloalkyl group, a phenyl group, a substituted phenyl group having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a halo- C_1 - C_6 alkyl group, a halo- C_1 - C_6 alkoxy group, a halo- C_1 - C_6 alkylthio group, a halo- C_1 - C_6 alkylsulfinyl group and a halo- C_1 - C_6 alkylsulfonyl group, or a group of the formula $-A^5-R^{12}$ (wherein A^5 is $-O-$, $-S-$, $-SO_2-$

5 or -SO_2^- ; and R^{12} is a $C_3\text{-}C_6$ cycloalkyl group, a halo- $C_3\text{-}C_6$ cycloalkyl group, a phenyl group, a substituted phenyl group having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a halo- $C_1\text{-}C_6$ alkyl group, a halo- $C_1\text{-}C_6$ alkoxy group, a halo- $C_1\text{-}C_6$ alkylthio group, a halo- $C_1\text{-}C_6$ alkylsulfinyl group and a halo- $C_1\text{-}C_6$ alkylsulfonyl group, a heterocyclic group (which is the same as defined above), a substituted heterocyclic group (wherein the heterocyclic group is the same as defined above) having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a halo- $C_1\text{-}C_6$ alkyl group, a halo- $C_1\text{-}C_6$ alkoxy group, a halo- $C_1\text{-}C_6$ alkylthio group, a halo- $C_1\text{-}C_6$ alkylsulfinyl group and a halo- $C_1\text{-}C_6$ alkylsulfonyl group; or a group of the formula $-A^6\text{-}R^{14}$ (wherein A^6 is a $C_1\text{-}C_6$ alkylene group, a halo- $C_1\text{-}C_6$ alkylene group, a $C_2\text{-}C_6$ alkenylene group, a halo- $C_2\text{-}C_6$ alkenylene group, a $C_2\text{-}C_6$ alkynylene group or a halo- $C_3\text{-}C_6$ alkynylene group; and R^{14} is a hydrogen atom, a halogen atom, a halo- $C_3\text{-}C_6$ cycloalkyl group, a halo- $C_1\text{-}C_6$ alkoxy group, a halo- $C_1\text{-}C_6$ alkylthio group, a halo- $C_1\text{-}C_6$ alkylsulfinyl group, a halo- $C_1\text{-}C_6$ alkylsulfonyl group, a phenyl group, a substituted phenyl group having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a halo- $C_1\text{-}C_6$ alkyl group, a halo- $C_1\text{-}C_6$ alkoxy group, a halo- $C_1\text{-}C_6$ alkylthio group, a halo- $C_1\text{-}C_6$ alkylsulfinyl group and a halo- $C_1\text{-}C_6$ alkylsulfonyl group, a phenoxy group, a substituted phenoxy group having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a halo- $C_1\text{-}C_6$ alkyl group, a halo- $C_1\text{-}C_6$ alkoxy group, a halo- $C_1\text{-}C_6$ alkylthio group, a halo- $C_1\text{-}C_6$ alkylsulfinyl group and a halo- $C_1\text{-}C_6$ alkylsulfonyl group, a phenylthio group, a substituted phenylthio group having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a halo- $C_1\text{-}C_6$ alkyl group, a halo- $C_1\text{-}C_6$ alkoxy group, a halo- $C_1\text{-}C_6$ alkylthio group, a halo- $C_1\text{-}C_6$ alkylsulfinyl group and a halo- $C_1\text{-}C_6$ alkylsulfonyl group, a heterocyclic group (which is the same as defined above), or a substituted heterocyclic group (wherein the heterocyclic group is the same as defined above) having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a halo- $C_1\text{-}C_6$ alkyl group, a halo- $C_1\text{-}C_6$ alkoxy group, a halo- $C_1\text{-}C_6$ alkylthio group, a halo- $C_1\text{-}C_6$ alkylsulfinyl group and a halo- $C_1\text{-}C_6$ alkylsulfonyl group); further,

30 Y^1 and Y^2 may form a condensed ring (which means naphthalene, tetrahydronaphthalene, indene, indane, quinoline, quinazoline, chroman, isochroman, indole, indoline, benzodioxane, benzodioxole, benzofuran, dihydrobenzofuran, benzothiophene, dihydrobenzothiophene, benzoxazole, benzothiazole, benzimidazole or indazole) by combining to each other together with the adjacent Y^3 , said condensed ring may have at least one substituent, which is the same or different, selected from the group consisting of a halogen atom, a $C_1\text{-}C_6$ alkyl group, a halo- $C_1\text{-}C_6$ alkyl group, a $C_1\text{-}C_6$ alkoxy group, a halo- $C_1\text{-}C_6$ alkoxy group, a $C_1\text{-}C_6$ alkylthio group, a halo- $C_1\text{-}C_6$ alkylthio group, a $C_1\text{-}C_6$ alkylsulfinyl group, a halo- $C_1\text{-}C_6$ alkylsulfinyl group, a phenyl group, a substituted phenyl group having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a $C_1\text{-}C_6$ alkyl group, a halo- $C_1\text{-}C_6$ alkyl group, a $C_1\text{-}C_6$ alkoxy group, a halo- $C_1\text{-}C_6$ alkoxy group, a $C_1\text{-}C_6$ alkylthio group, a halo- $C_1\text{-}C_6$ alkylthio group, a $C_1\text{-}C_6$ alkylsulfinyl group, a halo- $C_1\text{-}C_6$ alkylsulfinyl group, a phenylthio group, a substituted phenylthio group having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a halo- $C_1\text{-}C_6$ alkyl group, a halo- $C_1\text{-}C_6$ alkoxy group, a halo- $C_1\text{-}C_6$ alkylthio group, a halo- $C_1\text{-}C_6$ alkylsulfinyl group and a halo- $C_1\text{-}C_6$ alkylsulfonyl group, a heterocyclic group (which is the same as defined above), or a substituted heterocyclic group (wherein the heterocyclic group is the same as defined above) having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a halo- $C_1\text{-}C_6$ alkyl group, a halo- $C_1\text{-}C_6$ alkoxy group, a halo- $C_1\text{-}C_6$ alkylthio group, a halo- $C_1\text{-}C_6$ alkylsulfinyl group and a halo- $C_1\text{-}C_6$ alkylsulfonyl group); and

35 Z^1 and Z^2 are each an oxygen atom or a sulfur atom).

4. The phthalic acid diamide derivative according to Claim 2, represented by the general formula (I-2).



{wherein, R¹, R² and R³ may be the same or different, and are each a hydrogen atom, a C₃-C₆ cycloalkyl group, a halo-C₃-C₆ cycloalkyl group or a group of the formula -A¹-Q₁ (wherein, A¹ is a C₁-C₈ alkylene group, a C₃-C₆ alkenylene group or a C₃-C₆ alkynylene group; Q is a hydrogen atom, a halogen atom, a cyano group, a nitro group, a halo-C₁-C₆ alkyl group, a C₃-C₆ cycloalkyl group, a halo-C₃-C₆ cycloalkyl group, a C₁-C₆ alkoxy carbonyl group, a di-C₁-C₆ alkoxyphosphoryl group which may be the same or different, a di-C₁-C₆ alkoxythiophosphoryl group which may be the same or different, a diphenylphosphino group, a diphenylphosphono group, a phenyl group, a substituted phenyl group having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfanyl group, a halo-C₁-C₆ alkylsulfanyl group, a C₁-C₆ alkylsulfonyl group and a halo-C₁-C₆ alkylsulfonyl group, a heterocyclic group (which means pyridyl group, pyridine-N-oxide group, pyrimidyl group, furyl group, tetrahydrofuryl group, thieryl group, tetrahydrothienyl group, tetrahydropyranyl group, tetrahydrothiopyranyl group, oxazolyl group, isoxazolyl group, oxadiazolyl group, thiazolyl group, isothiazolyl group, thiadiazolyl group, imidazolyl group, triazolyl group or pyrazolyl group), a substituted heterocyclic group (wherein the heterocyclic group is the same as defined above) having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfanyl group, a halo-C₁-C₆ alkylsulfanyl group, a C₁-C₆ alkylsulfonyl group and a halo-C₁-C₆ alkylsulfonyl group, or a group of the formula -Z³-R⁵ (wherein Z³ is -O-, -S-, -SO-, -SO₂- or a group of the formula -N(R⁶)- (wherein R⁶ is a hydrogen atom, a C₁-C₆ alkyl carbonyl group, a halo-C₁-C₆ alkyl carbonyl group, a C₁-C₆ alkoxy carbonyl group, a phenyl carbonyl group, a substituted phenyl carbonyl group having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfanyl group, a halo-C₁-C₆ alkylsulfanyl group, a C₁-C₆ alkylsulfonyl group and a halo-C₁-C₆ alkylsulfonyl group, a phenyl C₁-C₄ alkoxy carbonyl group, or a substituted phenyl C₁-C₄ alkoxy carbonyl group having at least one substituent, in the phenyl ring, which may be the same or different and is selected from the group consisting of a halogen atom, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfanyl group, a halo-C₁-C₆ alkylsulfanyl group, a C₁-C₆ alkylsulfonyl group, a halo-C₁-C₆ alkylsulfonyl group, a C₁-C₆ alkylsulfonyl group and a halo-C₁-C₆ alkylsulfonyl group); and

R⁵ is a hydrogen atom, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₃-C₆ alkenyl group, a halo-C₃-C₆ alkenyl group, a C₃-C₆ alkynyl group, a halo-C₃-C₆ alkynyl group, a C₃-C₆ cycloalkyl group, a halo-C₃-C₆ cycloalkyl group, a C₁-C₆ alkyl carbonyl group, a halo-C₁-C₆ alkyl carbonyl group and a C₁-C₆ alkoxy carbonyl group, a phenyl group, a substituted phenyl group having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfanyl group, a halo-C₁-C₆ alkylsulfanyl group, a C₁-C₆ alkylsulfonyl group, a halo-C₁-C₆ alkylsulfonyl group, a C₁-C₆ alkylsulfonyl group and a halo-C₁-C₆ alkylsulfonyl group, a heterocyclic group (which is the same as defined above), or a substituted heterocyclic group (wherein the heterocyclic group is the same as defined above) having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfanyl group, a halo-C₁-C₆ alkylsulfanyl group, a C₁-C₆ alkylsulfonyl group, a halo-C₁-C₆ alkylsulfonyl group and a halo-C₁-C₆ alkylsulfonyl group, a heterocyclic group (which is the same as defined above), or a substituted heterocyclic group (wherein the heterocyclic group is the same as defined above) having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfanyl group, a halo-C₁-C₆ alkylsulfanyl group, a C₁-C₆ alkylsulfonyl group, a halo-C₁-C₆ alkylsulfonyl group and a halo-C₁-C₆ alkylsulfonyl group); and \mathfrak{l} is an integer of 1 to 4); further.

R¹ and R² may form a 4 to 7 membered ring by combining to each other, in which the ring may contain the same or different 1 to 3 hetero atoms selected from the group consisting of oxygen atom, sulfur atom and nitrogen atom;

X¹ and X² may be the same or different and are each a halogen atom, a cyano group, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfanyl group, a halo-C₁-C₆ alkylsulfanyl group, a C₁-C₆ alkylsulfonyl group and a halo-C₁-C₆ alkylsulfonyl group; further, X¹ and X² may form a condensed ring (which means naphthalene, tetrahydronaphthalene, indene, indane, quinoline, quinazoline, chroman, isochroman, indole, indoline, benzodioxane, benzodioxole, benzofuran, dihydrobenzofuran, benzothiophene, dihydrobenzothiophene, benzoxazole, benzothiazole, benzimidazole or indazole) by combining to each other, and said condensed ring may have at least one substituent, which is the same or different and is selected from the group consisting of a hal-

ogen atom, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkyl sulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group, a halo-C₁-C₆ alkylsulfonyl group, a phenyl group, a substituted phenyl group having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group and a halo-C₁-C₆ alkylsulfonyl group, a heterocyclic group (which is the same as defined above), and a substituted heterocyclic group (wherein the heterocyclic group is the same as defined above) having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group and a halo-C₁-C₆ alkylsulfonyl group; Y is the same or different, and are each a hydrogen atom, a halogen atom, a cyano group, a nitro group, a halo-C₃-C₆ cycloalkyl group, a phenyl group, a substituted phenyl group having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group and a halo-C₁-C₆ alkylsulfonyl group, a heterocyclic group (which is the same as defined above), a substituted heterocyclic group (wherein the heterocyclic group is the same as defined above) having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group and a halo-C₁-C₆ alkylsulfonyl group, or a group of -A²-R⁷ (wherein A² is -O-, -S-, -SO-, -SO₂-, -C(=O)-, -C(=NOR⁸)- (wherein R⁸ is a hydrogen atom, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₃-C₆ alkenyl group, a halo-C₃-C₆ alkenyl group, a C₃-C₆ alkynyl group, a C₃-C₆ cycloalkyl group, a phenyl-C₁-C₄ alkyl group, or a substituted phenyl-C₁-C₄ alkyl group having at least one substituent in the phenyl ring, which may be the same or different and is selected from the group consisting of a halogen atom, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group and a halo-C₁-C₆ alkylsulfonyl group), a C₁-C₆ alkylene group, a halo-C₁-C₆ alkylene group, a C₂-C₆ alkenylene group, a halo-C₂-C₆ alkenylene group, a C₂-C₆ alkynylene group or a halo-C₂-C₆ alkynylene group;

(1) when A^2 is $-O-$, $-S-$, $-SO-$ or $-SO_2-$, then R^7 is a halo- C_3-C_6 cycloalkyl group, a halo- C_3-C_6 cycloalkenyl group, a phenyl group, a substituted phenyl group having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a C_1-C_6 alkyl group, a halo- C_1-C_6 alkyl group, a C_1-C_6 alkoxy group, a halo- C_1-C_6 alkoxy group, a C_1-C_6 alkylthio group, a halo- C_1-C_6 alkylthio group, a C_1-C_6 alkylsulfinyl group, a halo- C_1-C_6 alkylsulfinyl group, a C_1-C_6 alkylsulfonyl group and a halo- C_1-C_6 alkylsulfonyl group, a heterocyclic group (which is the same as defined above), a substituted heterocyclic group (wherein the heterocyclic group is the same as defined above) having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a C_1-C_6 alkyl group, a halo- C_1-C_6 alkyl group, a C_1-C_6 alkoxy group, a halo- C_1-C_6 alkoxy group, a C_1-C_6 alkylthio group, a halo- C_1-C_6 alkylthio group, a C_1-C_6 alkylsulfinyl group, a halo- C_1-C_6 alkylsulfinyl group, a C_1-C_6 alkylsulfonyl group and a halo- C_1-C_6 alkylsulfonyl group, or a group of the formula $-A^3-R^9$ (wherein A^3 is a C_1-C_6 alkylene group, a halo- C_1-C_6 alkylene group, a C_3-C_6 alkenylene group, a halo- C_3-C_6 alkenylene group, a C_3-C_6 alkynylene group or a halo- C_3-C_6 alkynylene group; R^9 is a hydrogen atom, a halogen atom, a C_3-C_6 cycloalkyl group, a halo- C_3-C_6 cycloalkyl group, a C_1-C_6 alkoxy carbonyl group, a phenyl group, a substituted phenyl group having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a C_1-C_6 alkyl group, a halo- C_1-C_6 alkyl group, a C_1-C_6 alkoxy group, a halo- C_1-C_6 alkoxy group, a C_1-C_6 alkylthio group, a halo- C_1-C_6 alkylthio group, a C_1-C_6 alkylsulfinyl group, a halo- C_1-C_6 alkylsulfinyl group, a C_1-C_6 alkylsulfonyl group and a halo- C_1-C_6 alkylsulfonyl group, or a group of the formula $-A^4-R^{10}$ (wherein A^4 is $-O-$, $-S-$, $-SO-$, $-SO_2-$ or $-C(=O)-$, and R^{10} is a C_1-C_6 alkyl group, a halo- C_1-C_6 alkyl group, a C_3-C_6 alkenyl group, a halo- C_3-C_6 alkenyl group, a C_3-C_6 cycloalkyl group, a halo- C_3-C_6 cycloalkyl group, a phenyl group, a substituted phenyl group having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a C_1-C_6 alkyl group, a halo- C_1-C_6 alkyl group, a C_1-C_6 alkoxy group, a halo- C_1-C_6 alkoxy group, a C_1-C_6 alkylthio group, a halo- C_1-C_6 alkylthio group, a C_1-C_6 alkylsulfinyl group, a halo- C_1-C_6 alkylsulfinyl group, a C_1-C_6 alkylsulfonyl group and a halo- C_1-C_6 alkylsulfonyl group, a heterocyclic group (which is the same as defined above), or a substituted heterocyclic group (wherein the hetero-

cyclic group is the same as defined above) having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfanyl group, a halo-C₁-C₆ alkylsulfanyl group, a C₁-C₆ alkylsulfonyl group and a halo-C₁-C₆ alkylsulfonyl group);

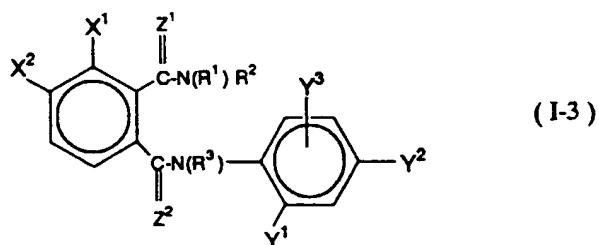
(2) when A² is -C(=O)- or a group of the formula -C(=NOR⁸)-(wherein R⁸ is the same as defined above), then R⁷ is a C₁-C₆ alkyl group, a halo C₁-C₆ alkyl group, a C₂-C₆ alkenyl group, a halo-C₂-C₆ alkenyl group, a C₃-C₆ cycloalkyl group, a halo-C₃-C₆ cycloalkyl group, a C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a mono-C₁-C₆ alkylamino group, a di-C₁-C₆ alkylamino group which may be the same or different, a phenyl group, a substituted phenyl group having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group and a halo-C₁-C₆ alkylsulfonyl group, a phenylamino group, a substituted phenylamino group having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group, and a halo-C₁-C₆ alkylsulfonyl group, a heterocyclic group (which is the same as defined the above), or a substituted heterocyclic group (wherein the heterocyclic group is the same as defined the above) having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group and a halo-C₁-C₆ alkylsulfonyl group.

(3) when A^2 is a C_1 - C_6 alkylene group, a halo- C_1 - C_6 alkylene group, C_2 - C_6 alkenylene group, a halo- C_2 - C_6 alkenylene group, a C_2 - C_6 alkynylene group or a halo- C_3 - C_6 alkynylene group, then R^7 is a hydrogen atom, a halogen atom, a C_3 - C_6 cycloalkyl group, a halo- C_3 - C_6 cycloalkyl group, a C_1 - C_6 alkoxy carbonyl group, a phenyl group, a substituted phenyl group having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a C_1 - C_6 alkyl group, a halo- C_1 - C_6 alkyl group, a C_1 - C_6 alkoxy group, a halo- C_1 - C_6 alkoxy group, a C_1 - C_6 alkylthio group, a halo- C_1 - C_6 alkylthio group, a C_1 - C_6 alkylsulfinyl group, a halo- C_1 - C_6 alkylsulfinyl group, a C_1 - C_6 alkylsulfonyl group and a halo- C_1 - C_6 alkylsulfonyl group, a heterocyclic group (which is the same as defined above), a substituted heterocyclic group (wherein the heterocyclic group is the same as defined above) having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a C_1 - C_6 alkyl group, a halo- C_1 - C_6 alkyl group, a C_1 - C_6 alkoxy group, a halo- C_1 - C_6 alkoxy group, a C_1 - C_6 alkylthio group, a halo- C_1 - C_6 alkylthio group, a C_1 - C_6 alkylsulfinyl group, a halo- C_1 - C_6 alkylsulfinyl group, a C_1 - C_6 alkylsulfonyl group and a halo- C_1 - C_6 alkylsulfonyl group, or a group of the formula $-A^5-R^{12}$ (wherein A^5 is $-O-$, $-S-$, $-SO-$ or $-SO_2-$; and R^{12} is a C_3 - C_6 cycloalkyl group, a halo- C_3 - C_6 cycloalkyl group, a phenyl group, a substituted phenyl group having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a C_1 - C_6 alkyl group, a halo- C_1 - C_6 alkyl group, a C_1 - C_6 alkoxy group, a halo- C_1 - C_6 alkoxy group, a C_1 - C_6 alkylthio group, a halo- C_1 - C_6 alkylthio group, a C_1 - C_6 alkylsulfinyl group, a halo- C_1 - C_6 alkylsulfinyl group, a C_1 - C_6 alkylsulfonyl group and a halo- C_1 - C_6 alkylsulfonyl group, a heterocyclic group (which is the same as defined above), a substituted heterocyclic group (wherein the heterocyclic group is the same as defined above) having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a C_1 - C_6 alkyl group, a halo- C_1 - C_6 alkyl group, a C_1 - C_6 alkoxy group, a halo- C_1 - C_6 alkoxy group, a C_1 - C_6 alkylthio group, a halo- C_1 - C_6 alkylthio group, a C_1 - C_6 alkylsulfinyl group, a halo- C_1 - C_6 alkylsulfinyl group, a C_1 - C_6 alkylsulfonyl group and a halo- C_1 - C_6 alkylsulfonyl group, or a group of the formula $-A^6-R^{14}$ (wherein A^6 is a C_1 - C_6 alkylene group, a halo- C_1 - C_6 alkylene group, a C_2 - C_6 alkenylene group, a halo- C_2 - C_6 alkenylene group, a C_2 - C_6 alkynylene group, or a halo- C_3 - C_6 alkynylene group; and R^{14} is a hydrogen atom, a halogen atom, a C_3 - C_6 cycloalkyl group, a halo- C_3 - C_6 cycloalkyl group, a C_1 - C_6 alkoxy group, a halo- C_1 - C_6 alkoxy group, a C_1 - C_6 alkylthio group, a halo- C_1 - C_6 alkylthio group, a C_1 - C_6 alkylsulfinyl group, a halo- C_1 - C_6 alkylsulfinyl group, a C_1 - C_6 alkylsulfonyl group, a halo- C_1 - C_6 alkylsulfonyl group, a phenyl group, a substituted phenyl group having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a C_1 - C_6 alkyl group, a halo- C_1 - C_6 alkyl group, a C_1 - C_6 alkoxy group, a halo- C_1 - C_6 alkoxy group, a C_1 - C_6 alkylthio group, a halo- C_1 - C_6 alkylthio group, a C_1 - C_6 alkylsulfinyl group, a halo- C_1 - C_6 alkylsulfinyl group, a C_1 - C_6 alkylsulfonyl group and a halo- C_1 - C_6 alkylsulfonyl group, a phenoxy group, a substituted phenoxy group having at least one

5 substituent which may be the same or different and is selected from the group consisting of a halogen atom, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfanyl group, a halo-C₁-C₆ alkylsulfanyl group, a C₁-C₆ alkylsulfonyl group and a halo-C₁-C₆ alkylsulfonyl group, a phenylthio group, a substituted phenylthio group having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfanyl group, a halo-C₁-C₆ alkylsulfanyl group, a C₁-C₆ alkylsulfonyl group and a halo-C₁-C₆ alkylsulfonyl group, a heterocyclic group (which is the same as defined the above), or a substituted heterocyclic group (wherein the heterocyclic ring is the same as defined above) having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfanyl group and a halo-C₁-C₆ alkylsulfanyl group, a heterocyclic group (which is the same as defined the above), or a substituted heterocyclic group (wherein the heterocyclic ring is the same as defined above) having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfanyl group and a halo-C₁-C₆ alkylsulfanyl group); and m is an integer of 1 to 5;

15 further, Y may form a condensed ring (which is the same as defined above) by combining together with the adjacent carbon atoms in the phenyl ring, said condensed ring may have at least one substituent, which is the same or different and is selected from the group consisting of a halogen atom, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfanyl group, a halo-C₁-C₆ alkylsulfanyl group, a phenyl group, a substituted phenyl group having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfanyl group, a halo-C₁-C₆ alkylsulfanyl group, a heterocyclic group (which is the same as defined above), and a substituted heterocyclic group (wherein the heterocyclic group is the same as defined above) having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfanyl group, a halo-C₁-C₆ alkylsulfanyl group, a C₁-C₆ alkylsulfonyl group and a halo-C₁-C₆ alkylsulfonyl group, a heterocyclic group (which is the same as defined above), and a substituted heterocyclic group (wherein the heterocyclic group is the same as defined above) having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfanyl group and a halo-C₁-C₆ alkylsulfanyl group, a heterocyclic group (which is the same as defined above), and a substituted heterocyclic group (wherein the heterocyclic group is the same as defined above) having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfanyl group and a halo-C₁-C₆ alkylsulfanyl group; Z¹ and Z² are each an oxygen atom or a sulfur atom).

5. The phthalic acid diamide derivative according to Claim 4, represented by the general formula (I-3),



45 {wherein, R¹, R² and R³ may be the same or different, and are each a hydrogen atom, a C₃-C₆ cycloalkyl group, a halo-C₃-C₆ cycloalkyl group or a group of the formula -A¹-Q_t (wherein, A¹ is a C₁-C₆ alkylene group, a C₃-C₆ alkylene group or a C₃-C₆ alkynylene group; Q is a hydrogen atom, a halogen atom, a cyano group, a nitro group, a halo-C₁-C₆ alkyl group, a C₃-C₆ cycloalkyl group, a halo-C₃-C₆ cycloalkyl group, a C₁-C₆ alkoxy carbonyl group, a di-C₁-C₆ alkoxyphosphoryl group which may be the same or different, a diphenylphosphino group, a diphenylphosphono group, a phenyl group, a substituted phenyl group having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfanyl group, a halo-C₁-C₆ alkylsulfanyl group, a C₁-C₆ alkylsulfonyl group and a halo-C₁-C₆ alkylsulfonyl group, a heterocyclic group (which means pyridyl group, pyridine-N-oxide group, pyrimidinyl group, furyl group, tetrahydrofuryl group, thieryl group, tetrahydrothienyl group, tetrahydropyranyl group, tetrahydrothiopyranyl group, oxazolyl group, isoxazolyl group, oxadiazolyl group, thiazolyl group, isothiazolyl group, thiadiazolyl group, imidazolyl group, triazolyl group or pyrazolyl

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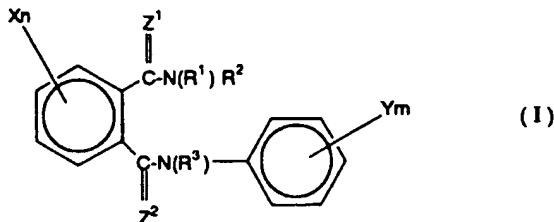
group), a substituted heterocyclic group (wherein the heterocyclic group is the same as defined above) having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group and a halo-C₁-C₆ alkylsulfonyl group, or a group of the formula -Z³-R⁵ (wherein Z³ is -O-, -S-, -SO-, -SO₂- or a group of the formula -N(R⁶)₂ (wherein R⁶ is a hydrogen atom, a C₁-C₆ alkylcarbonyl group a halo-C₁-C₆ alkylcarbonyl group, a C₁-C₆ alkoxy carbonyl group, a phenyl carbonyl group, a substituted phenyl carbonyl group having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group and a halo-C₁-C₆ alkylsulfonyl group, or a group of the formula -Z³-R⁵ (wherein Z³ is -O-, -S-, -SO-, -SO₂- or a group of the formula -N(R⁶)₂ (wherein R⁶ is a hydrogen atom, a C₁-C₆ alkylcarbonyl group a halo-C₁-C₆ alkylcarbonyl group, a C₁-C₆ alkoxy carbonyl group, a phenyl carbonyl group, a substituted phenyl carbonyl group having at least one substituent, in the phenyl ring, which may be the same or different and is selected from the group consisting of a halogen atom, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group and a halo-C₁-C₆ alkylsulfonyl group); and R⁵ is a hydrogen atom, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₃-C₆ alkenyl group, a halo-C₃-C₆ alkenyl group, a C₃-C₆ alkynyl group, a halo-C₃-C₆ alkynyl group, a C₃-C₆ cycloalkyl group, a halo-C₃-C₆ cycloalkyl group, a C₁-C₆ alkylcarbonyl group, a halo-C₁-C₆ alkylcarbonyl group, a C₁-C₆ alkoxy carbonyl group, a phenyl group, a substituted phenyl group having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group and a halo-C₁-C₆ alkylsulfonyl group, a phenyl C₁-C₄ alkyl group, a substituted phenyl C₁-C₄ alkyl group having at least one substituent, in the phenyl ring, which may be the same or different and is selected from the group consisting of a halogen atom, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group and a halo-C₁-C₆ alkylsulfonyl group, a heterocyclic group (which is the same as defined above), or a substituted heterocyclic group (wherein the heterocyclic group is the same as defined above) having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group and a halo-C₁-C₆ alkylsulfonyl group); and ℓ is an integer of 1 to 4); further,

R¹ and R² may form a 4 to 7 membered ring by combining to each other, in which the ring may contain the same or different 1 to 3 hetero atoms selected from the group consisting of oxygen atom, sulfur atom and nitrogen atom; X¹ and X² may be the same or different and are each a halogen atom, a cyano group, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group and a halo-C₁-C₆ alkylsulfonyl group; further, X¹ and X² may form a condensed ring (which means naphthalene, tetrahydronaphthalene, indene, indane, quinoline, quinazoline, chroman, isochroman, indole, indoline, benzodioxane, benzodioxole, benzofuran, dihydrobenzofuran, benzothiophene, dihydrobenzothiophene, benzoxazole, benzothiazole, benzimidazole or indazole) by combining to each other, and said condensed ring may have at least one substituent, which is the same or different and is selected from the group consisting of a halogen atom, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group, a halo-C₁-C₆ alkylsulfonyl group, a phenyl group, a substituted phenyl group having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group and a halo-C₁-C₆ alkylsulfonyl group, a heterocyclic group (which is the same as defined above), and a substituted heterocyclic group (wherein the heterocyclic group is the same as defined above) having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group and a halo-C₁-C₆ alkylsulfonyl group; Y¹ and Y³ may be the same or different, and are each a hydrogen atom, a halogen atom, a C₁-C₆ alkyl group,

a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group, a halo-C₁-C₆ alkylsulfonyl group, a phenyl group, and a substituted phenyl group having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group and a halo-C₁-C₆ alkylsulfonyl group;

5 Z¹ and Z² are each an oxygen atom or a sulfur atom}.

10 6. An agricultural and horticultural insecticides, which is characterized by containing, as the effective ingredient, a phthalic acid diamide derivative represented by the general formula (I).



wherein R¹, R² and R³ may be the same or different, and are each a hydrogen atom, a cyano group, a C₃-C₆ cycloalkyl group, a halo-C₃-C₆ cycloalkyl group, a C₃-C₆ cycloalkenyl group, a halo-C₃-C₆ cycloalkenyl group or a 25 group of the formula -A¹-Q₁ (wherein A¹ is -O-, -S-, -SO₂-, -C(=O)-, a group of the formula -N(R⁴)- (wherein R⁴ is a C₁-C₆ alkylcarbonyl group, a halo-C₁-C₆ alkylcarbonyl group, a C₁-C₆ alcoxycarbonyl group, a phenylcarbonyl group, or a substituted phenylcarbonyl group having at least one substituent which may be the same or different, and is selected from the group consisting of a halogen atom, a cyano group, a nitro group, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₂-C₆ alkenyl group, a halo-C₂-C₆ alkenyl group, a C₂-C₆ alkynyl group, a halo-C₂-C₆ alkynyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group, a halo-C₁-C₆ alkylsulfonyl group, a mono-C₁-C₆ alkylamino group and a di-C₁-C₆ alkylamino group which may be the same or different), a C₁-C₈ alkylene group, a C₃-C₆ alkenylene group or a C₃-C₆ alkynylene group;

35 (1) when A¹ is -O- or a group of the formula -N(R⁴)- (wherein R⁴ is the same as defined above), then Q is a hydrogen atom, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₃-C₆ alkenyl group, a halo-C₃-C₆ alkenyl group, a C₃-C₆ alkynyl group, a phenyl group, a substituted phenyl group having at least one substituent which 40 may be the same or different and is selected from the group consisting of a halogen atom, a cyano group, a nitro group, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₂-C₆ alkenyl group, a halo-C₂-C₆ alkenyl group, a C₂-C₆ alkynyl group, a halo-C₂-C₆ alkynyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group, a halo-C₁-C₆ alkylsulfonyl group, a mono-C₁-C₆ alkylamino group and a di-C₁-C₆ alkylamino group which may be the same or different, a phenyl-C₁-C₄ alkyl group or a substituted phenyl-C₁-C₄ alkyl group having at least one substituent, in the phenyl ring, which may be the same or different and is 45 selected from the group consisting of a halogen atom, a cyano group, a nitro group, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₂-C₆ alkenyl group, a halo-C₂-C₆ alkenyl group, a C₂-C₆ alkynyl group, a halo-C₂-C₆ alkynyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group, a halo-C₁-C₆ alkylsulfonyl group, a mono-C₁-C₆ alkylamino group and a di-C₁-C₆ alkylamino group which may be the same or different;

50 (2) when A¹ is -S-, -SO₂- or -C(=O)-, then Q is a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₃-C₆ alkenyl group, a halo-C₃-C₆ alkenyl group, a C₃-C₆ alkynyl group, a C₁-C₆ alkoxy group, a mono-C₁-C₆ alkylamino group, a di-C₁-C₆ alkylamino group which may be the same or different, a C₁-C₆ alcoxycarbonyl group, a phenyl group, a substituted phenyl group having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a cyano group, a nitro group, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₂-C₆ alkenyl group, a halo-C₂-C₆ alkenyl group, a C₂-C₆ alkynyl group, a halo-C₂-C₆ alkynyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group, a halo-C₁-C₆ alkylsulfonyl group, a mono-C₁-C₆ alkylamino group and a di-C₁-C₆ alkylamino group which may be the same or different;

5 C_6 alkylsulfinyl group, a C_1 - C_6 alkylsulfonyl group, a halo- C_1 - C_6 alkylsulfonyl group, a mono- C_1 - C_6 alkylamino group and a di- C_1 - C_6 alkylamino group which may be the same or different, a phenylamino group, a substituted phenylamino group having at least one substituent, in the phenyl ring, which may be the same or different and is selected from the group consisting of a halogen atom, a cyano group, a nitro group, a C_1 - C_6 alkyl group, a halo- C_1 - C_6 alkyl group, a C_2 - C_6 alkenyl group, a halo- C_2 - C_6 alkenyl group, a C_2 - C_6 alkynyl group, a halo- C_2 - C_6 alkynyl group, a C_1 - C_6 alkoxy group, a halo- C_1 - C_6 alkoxy group, a C_1 - C_6 alkylthio group, a halo- C_1 - C_6 alkylthio group, a C_1 - C_6 alkylsulfinyl group, a halo- C_1 - C_6 alkylsulfinyl group, a C_1 - C_6 alkylsulfonyl group, a halo- C_1 - C_6 alkylsulfonyl group, a mono- C_1 - C_6 alkylamino group and a di- C_1 - C_6 alkylamino group which may be the same or different, a naphthyl group, a substituted naphthyl group having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a cyano group, a nitro group, a C_1 - C_6 alkyl group, a halo- C_1 - C_6 alkyl group, a C_2 - C_6 alkenyl group, a halo- C_2 - C_6 alkenyl group, a C_2 - C_6 alkynyl group, a halo- C_2 - C_6 alkynyl group, a C_1 - C_6 alkoxy group, a halo- C_1 - C_6 alkoxy group, a C_1 - C_6 alkylthio group, a halo- C_1 - C_6 alkylthio group, a C_1 - C_6 alkylsulfinyl group, a halo- C_1 - C_6 alkylsulfinyl group, a C_1 - C_6 alkylsulfonyl group, a halo- C_1 - C_6 alkylsulfonyl group, a mono- C_1 - C_6 alkylamino group and a di- C_1 - C_6 alkylamino group which may be the same or different, a heterocyclic group (which means pyridyl group, pyridine-N-oxide group, pyrimidiny group, furyl group, tetrahydrofuryl group, thienyl group, tetrahydrothienyl group, tetrahydropyranyl group, tetrahydrothiopyranyl group, oxazolyl group, isoxazolyl group, oxadiazolyl group, thiazolyl group, isothiazolyl group, thiadiazolyl group, imidazolyl group, triazolyl group or a pyrazolyl group), or a substituted heterocyclic group (wherein the heterocyclic group is the same as defined above) having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a cyano group, a nitro group, a C_1 - C_6 alkyl group, a halo- C_1 - C_6 alkyl group, a C_2 - C_6 alkenyl group, a halo- C_2 - C_6 alkenyl group, a C_2 - C_6 alkynyl group, a halo- C_2 - C_6 alkynyl group, a C_1 - C_6 alkoxy group, a halo- C_1 - C_6 alkoxy group, a C_1 - C_6 alkylthio group, a halo- C_1 - C_6 alkylthio group, a C_1 - C_6 alkylsulfinyl group, a halo- C_1 - C_6 alkylsulfinyl group, a C_1 - C_6 alkylsulfonyl group, a halo- C_1 - C_6 alkylsulfonyl group, a mono- C_1 - C_6 alkylamino group and a di- C_1 - C_6 alkylamino group which may be the same or different,
 10 (3) when A^1 is a C_1 - C_8 alkylene group, a C_3 - C_6 alkylene group or a C_3 - C_6 alkynylene group, then Q is a hydrogen atom, a halogen atom, a cyano group, a nitro group, a halo- C_1 - C_6 alkyl group, a C_3 - C_6 cycloalkyl group, a halo- C_3 - C_6 cycloalkyl group, a C_1 - C_6 alkoxy carbonyl group, a di- C_1 - C_6 alkoxyphosphoryl group which may be the same or different, a di- C_1 - C_6 alkoxythiophosphoryl group which may be the same or different, a diphenylphosphino group, a diphenylphosphono group, a phenyl group, a substituted phenyl group having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a cyano group, a nitro group, a C_1 - C_6 alkyl group, a halo- C_1 - C_6 alkyl group, a C_2 - C_6 alkenyl group, a halo- C_2 - C_6 alkenyl group, a C_2 - C_6 alkynyl group, a halo- C_2 - C_6 alkynyl group, a C_1 - C_6 alkoxy group, a halo- C_1 - C_6 alkoxy group, a C_1 - C_6 alkylthio group, a halo- C_1 - C_6 alkylthio group, a C_1 - C_6 alkylsulfinyl group, a halo- C_1 - C_6 alkylsulfinyl group, a C_1 - C_6 alkylsulfonyl group, a halo- C_1 - C_6 alkylsulfonyl group, a mono- C_1 - C_6 alkylamino group and a di- C_1 - C_6 alkylamino group which may be the same or different, a naphthyl group, a substituted naphthyl group having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a cyano group, a nitro group, a C_1 - C_6 alkyl group, a halo- C_1 - C_6 alkyl group, a C_2 - C_6 alkenyl group, a halo- C_2 - C_6 alkenyl group, a C_2 - C_6 alkynyl group, a halo- C_2 - C_6 alkynyl group, a C_1 - C_6 alkoxy group, a halo- C_1 - C_6 alkoxy group, a C_1 - C_6 alkylthio group, a halo- C_1 - C_6 alkylthio group, a C_1 - C_6 alkylsulfinyl group, a halo- C_1 - C_6 alkylsulfinyl group, a C_1 - C_6 alkylsulfonyl group, a halo- C_1 - C_6 alkylsulfonyl group, a mono- C_1 - C_6 alkylamino group and a di- C_1 - C_6 alkylamino group which may be the same or different, a heterocyclic group (which is the same as defined above), a substituted heterocyclic group (wherein the heterocyclic group is the same as defined above) having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a cyano group, a nitro group, a C_1 - C_6 alkyl group, a halo- C_1 - C_6 alkyl group, a C_2 - C_6 alkenyl group, a halo- C_2 - C_6 alkenyl group, a C_2 - C_6 alkynyl group, a halo- C_2 - C_6 alkynyl group, a C_1 - C_6 alkoxy group, a halo- C_1 - C_6 alkoxy group, a C_1 - C_6 alkylthio group, a halo- C_1 - C_6 alkylthio group, a C_1 - C_6 alkylsulfinyl group, a halo- C_1 - C_6 alkylsulfinyl group, a C_1 - C_6 alkylsulfonyl group, a halo- C_1 - C_6 alkylsulfonyl group, a mono- C_1 - C_6 alkylamino group and a di- C_1 - C_6 alkylamino group which may be the same or different, or a group of the formula $-Z^3-R^5$ (wherein Z^3 is $-O-$, $-S-$, $-SO-$, $-SO_2-$ or a group of the formula $-N(R^6)$ (wherein R^6 is a hydrogen atom, a C_1 - C_6 alkyl carbonyl group, a halo- C_1 - C_6 alkyl carbonyl group, a C_1 - C_6 alkoxy carbonyl group, a phenyl carbonyl group, a substituted phenyl carbonyl group having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a cyano group, a nitro group, a C_1 - C_6 alkyl group, a halo- C_1 - C_6 alkyl group, a C_2 - C_6 alkenyl group, a halo- C_2 - C_6 alkenyl group, a C_2 - C_6 alkynyl group, a halo- C_2 - C_6 alkynyl group, a C_1 - C_6 alkoxy group, a halo- C_1 - C_6 alkoxy group, a C_1 - C_6 alkylthio group, a halo- C_1 - C_6 alkylthio group, a C_1 - C_6 alkylsulfinyl group, a halo- C_1 - C_6 alkylsulfinyl group, a C_1 - C_6 alkylsulfonyl group, a halo- C_1 - C_6 alkylsulfonyl group, a mono- C_1 - C_6 alkylamino group and a di- C_1 - C_6 alkylamino group which may be the same or different, a phenyl C_1 - C_4 alkoxy carbonyl

(ℓ is an integer of 1 to 4); further,

R¹ and R² may form a 4 to 7 membered ring by combining to each other, in which the ring may contain the same or different 1 to 3 hetero atoms selected from the group consisting of oxygen atom, sulfur atom and nitrogen atom;

X may be the same or different, and is a hydrogen atom, a halogen atom, a cyano group, a nitro group, a C₃-C₆ cycloalkyl group, a halo-C₃-C₆ cycloalkyl group, a phenyl group, a substituted phenyl group having at least one substituents which may be the same or different and is selected from the group consisting of a halogen atom, a cyano group, a nitro group, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₂-C₆ alkenyl group, a halo-C₂-C₆ alkenyl group, a C₂-C₆ alkynyl group, a halo-C₂-C₆ alkynyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group, a halo-C₁-C₆ alkylsulfonyl group, a mono-C₁-C₆ alkylamino group and a di-C₁-C₆ alkylamino group which may be the same or different, a naphthyl group, a substituted naphthyl group having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a cyano group, a nitro group, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₂-C₆ alkenyl group, a halo-C₂-C₆ alkenyl group, a C₂-C₆ alkynyl group, a halo-C₂-C₆ alkynyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group, a halo-C₁-C₆ alkylsulfonyl group, a mono-C₁-C₆ alkylamino group and a di-C₁-C₆ alkylamino group which may be the same or different, a heterocyclic group (which is the same as defined above), a substituted heterocyclic group (wherein the heterocyclic group is the same as defined above)

having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a cyano group, a nitro group, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₂-C₆ alkenyl group, a halo-C₂-C₆ alkenyl group, a C₂-C₆ alkynyl group, a halo-C₂-C₆ alkynyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group, a halo-C₁-C₆ alkylsulfonyl group, a mono-C₁-C₆ alkylamino group and a di-C₁-C₆ alkylamino group which may be the same or different, or a group of the formula -A²-R⁷ (wherein A² is -O-, -S-, -SO₂-, -C(=O)-, -C(=NOR⁸)- (wherein R⁸ is a hydrogen atom, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₃-C₆ alkenyl group, a halo-C₃-C₆ alkenyl group, a C₃-C₆ alkynyl group, a C₃-C₆ cycloalkyl group, a phenyl-C₁-C₄ alkyl group, or a substituted phenyl-C₁-C₄ alkyl group having at least one substituent, in the phenyl ring, which may be the same or different and is selected from the group consisting of a halogen atom, a cyano group, a nitro group, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₂-C₆ alkenyl group, a halo-C₂-C₆ alkenyl group, a C₂-C₆ alkynyl group, a halo-C₂-C₆ alkynyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a mono-C₁-C₆ alkylamino group and a di-C₁-C₆ alkylamino group which may be the same or different), a C₁-C₆ alkylene group, a halo-C₁-C₆ alkylene group, a C₂-C₆ alkenylene group or a halo-C₃-C₆ alkenylene group;

(1) when A² is -O-, -S-, -SO₂- or -SO₂-, then R⁷ is a hydrogen atom, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₃-C₆ alkenyl group, a halo-C₃-C₆ alkenyl group, a C₃-C₆ alkynyl group, a halo-C₃-C₆ alkynyl group, a C₃-C₆ cycloalkyl group, a halo-C₃-C₆ cycloalkyl group, a C₃-C₆ cycloalkenyl group, a halo-C₃-C₆ cycloalkenyl group, a di-C₁-C₆ alkoxyphosphoryl group which may be the same or different, a di-C₁-C₆ alkoxythiophosphoryl group which may be the same or different, a phenyl group, a substituted phenyl group having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a cyano group, a nitro group, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₂-C₆ alkenyl group, a halo-C₂-C₆ alkenyl group, a C₂-C₆ alkynyl group, a halo-C₂-C₆ alkynyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a mono-C₁-C₆ alkylamino group and a di-C₁-C₆ alkylamino group which may be the same or different, a naphthyl group, a substituted naphthyl group having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a cyano group, a nitro group, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₂-C₆ alkenyl group, a halo-C₂-C₆ alkenyl group, a C₂-C₆ alkynyl group, a halo-C₂-C₆ alkynyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a mono-C₁-C₆ alkylamino group and a di-C₁-C₆ alkylamino group which may be the same or different, a heterocyclic group (which is the same as defined above), a substituted heterocyclic group (wherein the heterocyclic group is the same as defined above) having at least one substituents which may be the same or different and are selected from the group consisting of a halogen atom, a cyano group, a nitro group, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₂-C₆ alkenyl group, a halo-C₂-C₆ alkenyl group, a C₂-C₆ alkynyl group, a halo-C₂-C₆ alkynyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group, a halo-C₁-C₆ alkylsulfonyl group, a mono-C₁-C₆ alkylamino group and a di-C₁-C₆ alkylamino group which may be the same or different, or a group of the formula -A³-R⁹ (wherein A³ is -C(=O)-, -SO₂-, a C₁-C₆ alkylene group, a halo-C₁-C₆ alkylene group, a C₂-C₆ alkenylene group, a halo-C₂-C₆ alkenylene group, a C₃-C₆ alkenylene group, or a halo-C₃-C₆ alkenylene group,

(i) when A³ is -C(=O)- or -SO₂-, then R⁹ is a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₁-C₆ alkoxy group, a mono-C₁-C₆ alkylamino group, a di-C₁-C₆ alkylamino group which may be the same or different, a phenyl group, a substituted phenyl group having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a cyano group, a nitro group, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₂-C₆ alkenyl group, a halo-C₂-C₆ alkenyl group, a C₂-C₆ alkynyl group, a halo-C₂-C₆ alkynyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group, a halo-C₁-C₆ alkylsulfonyl group, a mono-C₁-C₆ alkylamino group and a di-C₁-C₆ alkylamino group which may

5 alkenyl group, a C₂-C₆ alkynyl group, a halo-C₂-C₆ alkynyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group, a halo-C₁-C₆ alkylsulfonyl group, a mono-C₁-C₆ alkylamino group and a di-C₁-C₆ alkylamino group which may be the same or different, a naphthyl group, a substituted naphthyl group having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a cyano group, a nitro group, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₂-C₆ alkenyl group, a halo-C₂-C₆ alkenyl group, a C₂-C₆ alkynyl group, a halo-C₂-C₆ alkynyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group, a halo-C₁-C₆ alkylsulfonyl group, a mono-C₁-C₆ alkylamino group and a di-C₁-C₆ alkylamino group which may be the same or different, a heterocyclic group (which is the same as defined the above), or a substituted heterocyclic group (wherein the heterocyclic group is the same as defined the above) having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a cyano group, a nitro group, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₂-C₆ alkenyl group, a halo-C₂-C₆ alkenyl group, a C₂-C₆ alkynyl group, a halo-C₂-C₆ alkynyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group, a halo-C₁-C₆ alkylsulfonyl group, a mono-C₁-C₆ alkylamino group and a di-C₁-C₆ alkylamino group which may be the same or different);

10 (2) when A² is -C(=O)- or a group of the formula -C(=NOR⁸)-(wherein R⁸ is the same as defined above), then R⁷ is a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₂-C₆ alkenyl group, a halo-C₂-C₆ alkenyl group, a C₃-C₆ cycloalkyl group, a halo-C₃-C₆ cycloalkyl group, a C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a mono-C₁-C₆ alkylamino group, a di-C₁-C₆ alkylamino group which may be the same or different, a phenyl group, a substituted phenyl group having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a cyano group, a nitro group, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₂-C₆ alkenyl group, a halo-C₂-C₆ alkenyl group, a C₂-C₆ alkynyl group, a halo-C₂-C₆ alkynyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group, a halo-C₁-C₆ alkylsulfonyl group, a mono-C₁-C₆ alkylamino group and a di-C₁-C₆ alkylamino group which may be the same or different, a phenylamino group, a substituted phenylamino group having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a cyano group, a nitro group, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₂-C₆ alkenyl group, a halo-C₂-C₆ alkenyl group, a C₂-C₆ alkynyl group, a halo-C₂-C₆ alkynyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group, a halo-C₁-C₆ alkylsulfonyl group, a mono-C₁-C₆ alkylamino group and a di-C₁-C₆ alkylamino group which may be the same or different, a naphthyl group, a substituted naphthyl group having one or more substituents which may be the same or different and are selected from the group consisting of a halogen atom, a cyano group, a nitro group, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₂-C₆ alkenyl group, a halo-C₂-C₆ alkenyl group, a C₂-C₆ alkynyl group, a halo-C₂-C₆ alkynyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group, a halo-C₁-C₆ alkylsulfonyl group, a mono-C₁-C₆ alkylamino group and a di-C₁-C₆ alkylamino group which may be the same or different, a heterocyclic group (which is the same as defined above), or a substituted heterocyclic group (wherein the heterocyclic group is the same as defined above) having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a cyano group, a nitro group, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₂-C₆ alkenyl group, a halo-C₂-C₆ alkenyl group, a C₂-C₆ alkynyl group, a halo-C₂-C₆ alkynyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group, a halo-C₁-C₆ alkylsulfonyl group, a mono-C₁-C₆ alkylamino group and a di-C₁-C₆ alkylamino group which may be the same or different,

15 (3) when A² is a C₁-C₆ alkylene group, a halo-C₁-C₆ alkylene group, C₂-C₆ alkenylene group, a halo-C₂-C₆ alkenylene group, a C₂-C₆ alkynylene group or a halo-C₃-C₆ alkynylene group, then R⁷ is a hydrogen atom, a halogen atom, a C₃-C₆ cycloalkyl group, a halo-C₃-C₆ cycloalkyl group, a C₁-C₆ alkoxycarbonyl group, a phenyl group, a substituted phenyl group having at least one substituent

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group, a mono-C₁-C₆ alkylamino group and a di-C₁-C₆ alkylamino group which may be the same or different, a heterocyclic group (which is the same as defined above), a substituted heterocyclic group (wherein the heterocyclic group is the same as defined above) having at least one substituents which may be the same or different and is selected from the group consisting of a halogen atom, a cyano group, a nitro group, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₂-C₆ alkenyl group, a halo-C₂-C₆ alkenyl group, a C₂-C₆ alkynyl group, a halo-C₂-C₆ alkynyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfanyl group, a halo-C₁-C₆ alkylsulfanyl group, a C₁-C₆ alkylsulfonyl group, a halo-C₁-C₆ alkylsulfonyl group, a mono-C₁-C₆ alkylamino group and a di-C₁-C₆ alkylamino group which may be the same or different, or a group of the formula -A⁶-R¹⁴ (wherein A⁶ is -C(=O)-, -SO₂-, a C₁-C₆ alkylene group, a halo-C₁-C₆ alkylene group, a C₂-C₆ alkenylene group, a halo-C₂-C₆ alkenylene group, a C₂-C₆ alkynylene group or a halo-C₃-C₆ alkynylene group;

(i) when A⁶ is -C(=O)- or -SO₂-, then R¹⁴ is a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a phenyl group, a substituted phenyl group having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a cyano group, a nitro group, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₂-C₆ alkenyl group, a halo-C₂-C₆ alkenyl group, a C₂-C₆ alkynyl group, a halo-C₂-C₆ alkynyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group, a halo-C₁-C₆ alkylsulfonyl group, a mono-C₁-C₆ alkylamino group and a di-C₁-C₆ alkylamino group which may be the same or different, a naphthyl group, a substituted naphthyl group having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a cyano group, a nitro group, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₂-C₆ alkenyl group, a halo-C₂-C₆ alkenyl group, a C₂-C₆ alkynyl group, a halo-C₂-C₆ alkynyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group, a halo-C₁-C₆ alkylsulfonyl group, a mono-C₁-C₆ alkylamino group and a di-C₁-C₆ alkylamino group which may be the same or different, a heterocyclic group (which is the same as defined above), or a substituted heterocyclic group (wherein the heterocyclic group is the same as defined the above) having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a cyano group, a nitro group, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₂-C₆ alkenyl group, a halo-C₂-C₆ alkenyl group, a C₂-C₆ alkynyl group, a halo-C₂-C₆ alkynyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group, a halo-C₁-C₆ alkylsulfonyl group, a mono-C₁-C₆ alkylamino group and a di-C₁-C₆ alkylamino group which may be the same or different;

(ii) when A^6 is a C_1 - C_6 alkylene group, a halo- C_1 - C_6 alkylene group, a C_2 - C_6 alkenylene group, a halo- C_2 - C_6 alkenylene group, a C_2 - C_6 alkynylene group or a halo- C_3 - C_6 alkynylene group, then R^{14} is a hydrogen atom, a halogen atom, a cyano group, a C_3 - C_6 cycloalkyl group, a halo- C_3 - C_6 cycloalkyl group, a C_1 - C_6 alkoxy group, a halo- C_1 - C_6 alkoxy group, a C_1 - C_6 alkylthio group, a halo- C_1 - C_6 alkylthio group, a C_1 - C_6 alkylsulfinyl group, a halo- C_1 - C_6 alkylsulfinyl group, a C_1 - C_6 alkylsulfonyl group, a halo- C_1 - C_6 alkylsulfonyl group, a C_1 - C_6 alkylcarbonyl group, a halo- C_1 - C_6 alkylcarbonyl group, a C_1 - C_6 alkoxycarbonyl group, a phenyl group, a substituted phenyl group having at least one substituent which may be the same or different and are selected from the group consisting of a halogen atom, a cyano group, a nitro group, a C_1 - C_6 alkyl group, a halo- C_1 - C_6 alkyl group, a C_2 - C_6 alkenyl group, a halo- C_2 - C_6 alkenyl group, a C_2 - C_6 alkynyl group, a halo- C_2 - C_6 alkynyl group, a C_1 - C_6 alkoxy group, a halo- C_1 - C_6 alkoxy group, a C_1 - C_6 alkylthio group, a halo- C_1 - C_6 alkylthio group, a C_1 - C_6 alkylsulfinyl group, a halo- C_1 - C_6 alkylsulfinyl group, a C_1 - C_6 alkylsulfonyl group, a halo- C_1 - C_6 alkylsulfonyl group, a mono- C_1 - C_6 alkylamino group and a di- C_1 - C_6 alkylamino group which may be the same or different, a phenoxy group, a substituted phenoxy group having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a cyano group, a nitro group, a C_1 - C_6 alkyl group, a halo- C_1 - C_6 alkyl group, a C_2 - C_6 alkenyl group, a halo- C_2 - C_6 alkenyl group, a C_2 - C_6 alkynyl group, a halo- C_2 - C_6 alkynyl group, a C_1 - C_6 alkoxy group, a halo- C_1 - C_6 alkoxy group, a C_1 - C_6 alkylthio group, a halo- C_1 - C_6 alkylthio group, a C_1 - C_6 alkylsulfinyl group, a halo- C_1 - C_6 alkylsulfinyl group, a C_1 - C_6 alkylsulfonyl group, a halo- C_1 - C_6 alkylsulfonyl group, a mono- C_1 - C_6 alkylamino group and a di- C_1 - C_6 alkylamino group which may be the same or different, a phenylthio group, a sub-

stituted phenylthio group having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a cyano group, a nitro group, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₂-C₆ alkenyl group, a halo-C₂-C₆ alkenyl group, a C₂-C₆ alkynyl group, a halo-C₂-C₆ alkynyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group, a halo-C₁-C₆ alkylsulfonyl group, a mono-C₁-C₆ alkylamino group and a di-C₁-C₆ alkylamino group which may be the same or different; a naphthyl group, a substituted naphthyl group having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a cyano group, a nitro group, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₂-C₆ alkenyl group, a halo-C₂-C₆ alkenyl group, a C₂-C₆ alkynyl group, a halo-C₂-C₆ alkynyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group, a halo-C₁-C₆ alkylsulfonyl group, a mono-C₁-C₆ alkylamino group and a di-C₁-C₆ alkylamino group which may be the same or different; a heterocyclic group (which is the same as defined above), or a substituted heterocyclic group (wherein the heterocyclic group is the same as defined above) having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a cyano group, a nitro group, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₂-C₆ alkenyl group, a halo-C₂-C₆ alkenyl group, a C₂-C₆ alkynyl group, a halo-C₂-C₆ alkynyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group, a halo-C₁-C₆ alkylsulfonyl group, a mono-C₁-C₆ alkylamino group and a di-C₁-C₆ alkylamino group which may be the same or different));

n is an integer of 1 to 4;
 further, X may form a condensed ring (which means naphthalene, tetrahydronaphthalene, indene, indane, quinoline, quinazoline, chroman, isochroman, indole, indoline, benzodioxane, benzodioxole, benzofuran, dihydrobenzofuran, benzothiophene, dihydrobenzothiophene, benzoxazole, benzothiazole, benzimidazole or indazole), by combining together with the adjacent carbon atoms in the phenyl ring, and said condensed ring may have at least one substituents, which may be the same or different, and selected from the group consisting of a halogen atom, a cyano group, a nitro group, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₂-C₆ alkenyl group, a halo-C₂-C₆ alkenyl group, a C₂-C₆ alkynyl group, a halo-C₂-C₆ alkynyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group, a halo-C₁-C₆ alkylsulfonyl group, a mono-C₁-C₆ alkylamino group and a di-C₁-C₆ alkylamino group which may be the same or different, a phenyl group, a substituted phenyl group having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a cyano group, a nitro group, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₂-C₆ alkenyl group, a halo-C₂-C₆ alkenyl group, a C₂-C₆ alkynyl group, a halo-C₂-C₆ alkynyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group, a halo-C₁-C₆ alkylsulfonyl group, a mono-C₁-C₆ alkylamino group and a di-C₁-C₆ alkylamino group which may be the same or different, a naphthyl group, a substituted naphthyl group having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a cyano group, a nitro group, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₂-C₆ alkenyl group, a halo-C₂-C₆ alkenyl group, a C₂-C₆ alkynyl group, a halo-C₂-C₆ alkynyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group, a halo-C₁-C₆ alkylsulfonyl group, a mono-C₁-C₆ alkylamino group and a di-C₁-C₆ alkylamino group which may be the same or different, a heterocyclic group (which is the same as defined above), and a substituted heterocyclic group (wherein the heterocyclic group is the same as defined above) having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a cyano group, a nitro group, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₂-C₆ alkenyl group, a halo-C₂-C₆ alkenyl group, a C₂-C₆ alkynyl group, a halo-C₂-C₆ alkynyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group, a halo-C₁-C₆ alkylsulfonyl group, a mono-C₁-C₆ alkylamino group and a di-C₁-C₆ alkylamino group which may be the same or different; Y is the same or different, and is a hydrogen atom, a halogen atom, a cyano group, a nitro group, a C₃-C₆ cycloalkyl group, a halo-C₃-C₆ cycloalkyl group, a di-C₁-C₆ alkoxyphosphoryl group which may be the

same or different, a di-C₁-C₆ alkoxythiophosphoryl group which may be the same or different, a phenyl group, a substituted phenyl group having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a cyano group, a nitro group, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₂-C₆ alkenyl group, a halo-C₂-C₆ alkenyl group, a C₂-C₆ alkynyl group, a halo-C₂-C₆ alkynyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfanyl group, a halo-C₁-C₆ alkylsulfanyl group, a mono-C₁-C₆ alkylamino group and a di-C₁-C₆ alkylamino group which may be the same or different, a naphthyl group, a substituted naphthyl group having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a cyano group, a nitro group, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkenyl group, a C₂-C₆ alkenyl group, a halo-C₂-C₆ alkenyl group, a C₂-C₆ alkynyl group, a halo-C₂-C₆ alkynyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfanyl group, a halo-C₁-C₆ alkylsulfanyl group, a mono-C₁-C₆ alkylamino group and a di-C₁-C₆ alkylamino group which may be the same or different, a heterocyclic group (which is the same as defined above), a substituted heterocyclic group (wherein the heterocyclic group is the same as defined above) having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a cyano group, a nitro group, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₂-C₆ alkenyl group, a halo-C₂-C₆ alkenyl group, a C₂-C₆ alkynyl group, a halo-C₂-C₆ alkynyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfanyl group, a halo-C₁-C₆ alkylsulfanyl group, a mono-C₁-C₆ alkylamino group and a di-C₁-C₆ alkylamino group which may be the same or different, or a group of the formula -A²-R⁷ (wherein A² and R⁷ are the same as defined above);

m is an integer of 1 to 5;

further, Y may form a condensed ring (the condensed ring is the same as defined above), by combining together with the adjacent carbon atoms in the phenyl ring, said condensed ring may have at least one substituents, which may be the same or different, and selected from the group consisting of a halogen atom, a cyano group, a nitro group, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₂-C₆ alkenyl group, a halo-C₂-C₆ alkenyl group, a C₂-C₆ alkynyl group, a halo-C₂-C₆ alkynyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfanyl group, a halo-C₁-C₆ alkylsulfanyl group, a mono-C₁-C₆ alkylamino group, a di-C₁-C₆ alkylamino group which may be the same or different, a phenyl group, a substituted phenyl group having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a cyano group, a nitro group, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₂-C₆ alkenyl group, a halo-C₂-C₆ alkenyl group, a C₂-C₆ alkynyl group, a halo-C₂-C₆ alkynyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfanyl group, a halo-C₁-C₆ alkylsulfanyl group, a mono-C₁-C₆ alkylamino group and a di-C₁-C₆ alkylamino group which may be the same or different, a naphthyl group, a substituted naphthyl group having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a cyano group, a nitro group, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkenyl group, a C₂-C₆ alkenyl group, a halo-C₂-C₆ alkenyl group, a C₂-C₆ alkynyl group, a halo-C₂-C₆ alkynyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfanyl group, a halo-C₁-C₆ alkylsulfanyl group, a mono-C₁-C₆ alkylamino group and a di-C₁-C₆ alkylamino group which may be the same or different, a heterocyclic group (which is the same as defined above), and a substituted heterocyclic group (wherein said heterocyclic group is the same as defined above) having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a cyano group, a nitro group, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₂-C₆ alkenyl group, a halo-C₂-C₆ alkenyl group, a C₂-C₆ alkynyl group, a halo-C₂-C₆ alkynyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfanyl group, a halo-C₁-C₆ alkylsulfanyl group, a mono-C₁-C₆ alkylamino group and a di-C₁-C₆ alkylamino group which may be the same or different;

Z¹ and Z² are each represents an oxygen atom or a sulfur atom.

55 7. The agricultural and horticultural insecticides according to Claim 6,
 wherein R¹, R² and R³ may be the same or different, and are each a hydrogen atom, a C₃-C₆ cycloalkyl group, a halo-C₃-C₆ cycloalkyl group, or a group of the formula -A¹-Q_t (wherein A¹ is a C₁-C₈ alkylene group, a C₃-

C₆ alkenylene group or a C₃-C₆ alkynylene group; and Q is a hydrogen atom, a halogen atom, a cyano group, a nitro group, a halo-C₁-C₆ alkyl group, a C₃-C₆ cycloalkyl group, a halo-C₃-C₆ cycloalkyl group, a C₁-C₆ alkoxy carbonyl group, a di-C₁-C₆ alkoxyphosphoryl group which may be the same or different, a di-C₁-C₆ alkoxythiophosphoryl group which may be the same or different, a diphenylphosphino group, a diphenylphosphonio group, a phenyl group, a substituted phenyl group having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfanyl group, a halo-C₁-C₆ alkylsulfanyl group, a C₁-C₆ alkylsulfonyl group and a halo-C₁-C₆ alkylsulfonyl group, a heterocyclic group (which means pyridyl group, pyridine-N-oxide group, pyrimidinyl group, furyl group, tetrahydrofuryl group, thieryl group, tetrahydrothienyl group, tetrahydropyranyl group, tetrahydrothiopyranyl group, oxazolyl group, isoxazolyl group, oxadiazolyl group, thiazolyl group, isothiazolyl group, thiadiazolyl group, imidazolyl group, triazolyl group or pyrazolyl group), a substituted heterocyclic group (wherein the heterocyclic group is the same as defined above) having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfanyl group, a halo-C₁-C₆ alkylsulfanyl group, a C₁-C₆ alkylsulfonyl group and a halo-C₁-C₆ alkylsulfonyl group, or a group of the formula -Z³-R⁵ (wherein Z³ is -O-, -S-, -SO-, -SO₂- or a group of the formula -N(R⁶)- (wherein R⁶ is a hydrogen atom, a C₁-C₆ alkylcarbonyl group, a halo-C₁-C₆ alkylcarbonyl group, a C₁-C₆ alkoxy carbonyl group, a phenylcarbonyl group, a substituted phenylcarbonyl group having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfanyl group, a halo-C₁-C₆ alkylsulfanyl group, a C₁-C₆ alkylsulfonyl group and a halo-C₁-C₆ alkylsulfonyl group, or a substituted phenyl C₁-C₄ alkoxy carbonyl group having at least one substituent, in the phenyl ring, which may be the same or different and is selected from the group consisting of a halogen atom, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfanyl group, a halo-C₁-C₆ alkylsulfanyl group, a C₁-C₆ alkylsulfonyl group and a halo-C₁-C₆ alkylsulfonyl group,); and R⁵ is a hydrogen atom, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₃-C₆ alkenyl group, a halo-C₃-C₆ alkenyl group, a C₃-C₆ alkynyl group, a halo-C₃-C₆ alkynyl group, a C₃-C₆ cycloalkyl group, a halo-C₃-C₆ cycloalkyl group, a C₁-C₆ alkylcarbonyl group, a halo-C₁-C₆ alkylcarbonyl group, a C₁-C₆ alkoxy carbonyl group, a phenyl group, a substituted phenyl group having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfanyl group, a halo-C₁-C₆ alkylsulfanyl group, a C₁-C₆ alkylsulfonyl group and a halo-C₁-C₆ alkylsulfonyl group, a phenyl C₁-C₄ alkyl group, a substituted phenyl C₁-C₄ alkyl group having at least one substituent, in the phenyl ring, which may be the same or different and is selected from the group consisting of a halogen atom, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfanyl group, a halo-C₁-C₆ alkylsulfanyl group, a C₁-C₆ alkylsulfonyl group and a halo-C₁-C₆ alkylsulfonyl group, a heterocyclic group (which is the same as defined above), or a substituted heterocyclic group (wherein the heterocyclic group is the same as defined above) having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfanyl group, a halo-C₁-C₆ alkylsulfanyl group, a C₁-C₆ alkylsulfonyl group and a halo-C₁-C₆ alkylsulfonyl group); and ℓ is an integer of 1 to 4;

45 R¹ and R² may form a 4 to 7 membered ring by combining to each other, in which the ring may contain the same or different 1 to 3 hetero atoms selected from the group consisting of oxygen atom, sulfur atom and nitrogen atom;

50 X may be the same or different, and is a hydrogen atom, a halogen atom, a cyano group, a nitro group, a C₃-C₆ cycloalkyl group, a halo-C₃-C₆ cycloalkyl group, a phenyl group, a substituted phenyl group having at least one substituents which may be the same or different and is selected from the group consisting of a halogen atom, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group and a halo-C₁-C₆ alkylsulfonyl group, a heterocyclic group (which is the same as defined above), a substituted heterocyclic group (wherein the heterocyclic group is the same as defined above) having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆

alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group, and a halo-C₁-C₆ alkylsulfonyl group, or a group of the formula -A²-R⁷ (wherein A² is -O-, -S-, -SO-, -SO₂-, -C(=O)-, -C(=NOR⁸)-(wherein R⁸ is a hydrogen atom, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₃-C₆ alkenyl group, a halo-C₃-C₆ alkenyl group, a C₃-C₆ alkynyl group, a C₃-C₆ cycloalkyl group, a phenyl-C₁-C₄ alkyl group, or a substituted phenyl-C₁-C₄ alkyl group having at least one substituent, in the phenyl ring, which may be the same or different and is selected from the group consisting of a halogen atom, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group and a halo-C₁-C₆ alkylsulfonyl group), a C₁-C₆ alkylene group, a halo-C₁-C₆ alkylene group, a C₂-C₆ alkenylene group, a halo-C₂-C₆ alkenylene group, a C₂-C₆ alkynylene group or a halo-C₃-C₆ alkynylene group;

(1) when A² is -O-, -S-, -SO- or -SO₂-, then R⁷ is a halo-C₃-C₆ cycloalkyl group, a halo-C₃-C₆ cycloalkenyl group, a phenyl group, a substituted phenyl group having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group and a halo-C₁-C₆ alkylsulfonyl group, a heterocyclic group (which is the same as defined above), a substituted heterocyclic group (wherein the heterocyclic group is the same as defined above) having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group and a halo-C₁-C₆ alkylsulfonyl group, or a group of the formula -A³-R⁹ (wherein A³ is a C₁-C₆ alkylene group, a halo-C₁-C₆ alkylene group, a C₃-C₆ alkenylene group, a halo-C₃-C₆ alkenylene group, a C₃-C₆ alkynylene group or a halo-C₃-C₆ alkynylene group; R⁹ is a hydrogen atom, a halogen atom, a C₃-C₆ cycloalkyl group, a halo-C₃-C₆ cycloalkyl group, a C₁-C₆ alkoxy carbonyl group, a phenyl group, a substituted phenyl group having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group and a halo-C₁-C₆ alkylsulfonyl group, or a group of the formula -A⁴-R¹⁰ (wherein A⁴ is -O-, -S-, -SO- or -C(=O)-, and R¹⁰ is a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₃-C₆ alkenyl group, a halo-C₃-C₆ alkenyl group, a C₃-C₆ cycloalkyl group, a halo-C₃-C₆ cycloalkyl group, a phenyl group, a substituted phenyl group having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group and a halo-C₁-C₆ alkylsulfonyl group);

(2) when A² is -C(=O)- or a group of the formula -C(=NOR⁸)-(wherein R⁸ is the same as defined above), then R⁷ is a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₂-C₆ alkenyl group, a halo-C₂-C₆ alkenyl group, a C₃-C₆ cycloalkyl group, a halo-C₃-C₆ cycloalkyl group, a C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a mono-C₁-C₆ alkylamino group, a di-C₁-C₆ alkylamino group which may be the same or different, a phenyl group, a substituted phenyl group having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group and a halo-C₁-C₆ alkylsulfonyl group, a phenylamino group, a substituted phenylamino group having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group and a halo-C₁-C₆ alkylsulfonyl group, and a halo-C₁-C₆ alkylsulfonyl group, a heterocyclic group (which is the same as defined the above), or a substituted heterocyclic group (wherein the heterocyclic group is the same as defined the above) having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₁-C₆ alkoxy

group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfonyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group and a halo-C₁-C₆ alkylsulfonyl group,

n is an integer of 1 to 4;

further, X may form a condensed ring (which means naphthalene, tetrahydronaphthalene, indene, indane, quinoline, quinazoline, chroman, isochroman, indole, indoline, benzodioxane, benzodioxole, benzofuran, dihydrobenzofuran, benzothiophene, dihydrobenzothiophene, benzoxazole, benzothiazole, benzimidazole or indazole), by combining together with the adjacent carbon atoms in the phenyl ring, said condensed ring may have at least one substituent, which may be the same or different, and is selected from the group consisting of

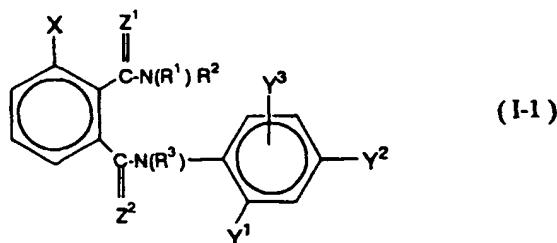
a halogen atom, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group, a halo-C₁-C₆ alkylsulfonyl group, a phenyl group, a substituted phenyl group having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group and a halo-C₁-C₆ alkylsulfonyl group, a heterocyclic group (which is the same as defined above), and a substituted heterocyclic group (wherein the heterocyclic group is the same as defined above) having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group and a halo-C₁-C₆ alkylsulfonyl group;

Y is the same or different, and is a hydrogen atom, a halogen atom, a cyano group, a nitro group, a halo-C₃-C₆ cycloalkyl group, a phenyl group, a substituted phenyl group having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group and a halo-C₁-C₆ alkylsulfonyl group, a heterocyclic group (which is the same as defined above), a substituted heterocyclic group (wherein the heterocyclic group is the same as defined above) having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group and a halo-C₁-C₆ alkylsulfonyl group, or a group of the formula -A²-R⁷ (wherein A² and R⁷ are the same as defined above);

m is an integer of 1 to 5; further, Y may form a condensed ring (the same as defined above), by combining together with the adjacent carbon atoms in the phenyl ring, said condensed ring may have at least one substituent, which may be the same or different, and is selected from the group consisting of a halogen atom, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group, a halo-C₁-C₆ alkylsulfonyl group, a phenyl group, a substituted phenyl group having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group and a halo-C₁-C₆ alkylsulfonyl group, a heterocyclic group (which is the same as defined above), and a substituted heterocyclic group (wherein said heterocyclic group is the same as defined above) having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group and a halo-C₁-C₆ alkylsulfonyl group; and Z¹ and Z² are each represents an oxygen atom or a sulfur atom.

8. The agricultural and horticultural insecticides according to Claim 7, containing as the effective ingredient, a phthalic acid diamide derivative represented by the general formula (I-1),

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(wherein, R¹, R² and R³ may be the same or different, and are each a hydrogen atom, a C₃-C₆ cycloalkyl group, a halo-C₃-C₆ cycloalkyl group or a group of the formula -A¹-Q₁ (wherein, A¹ is a C₁-C₆ alkylene group, a C₃-C₆ alke-

55

nylene group or a C₃-C₆ alkynylene group; Q is a hydrogen atom, a halogen atom, a cyano group, a nitro group, a halo-C₁-C₆ alkyl group, a C₃-C₆ cycloalkyl group, a halo-C₃-C₆ cycloalkyl group, a C₁-C₆ alkoxy carbonyl group, a di-C₁-C₆ alkoxyphosphoryl group which may be the same or different, a di-C₁-C₆ alkoxythiophosphoryl group which may be the same or different, a diphenylphosphino group, a diphenylphosphono group, a phenyl group, a substituted phenyl group having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group and a halo-C₁-C₆ alkylsulfonyl group, a heterocyclic group (which means pyridyl group, pyridine-N-oxide group, pyrimidinyl group, furyl group, tetrahydrofuryl group, thienyl group, tetrahydrothienyl group, tetrahydropyranyl group, tetrahydrothiopyranyl group, oxazolyl group, isoxazolyl group, oxadiazolyl group, thiazolyl group, isothiazolyl group, thiadiazolyl group, imidazolyl group, triazolyl group or pyrazolyl group), a substituted heterocyclic group (wherein the heterocyclic group is the same as defined above) having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group and a halo-C₁-C₆ alkylsulfonyl group, or a group of the formula -Z³-R⁵ (wherein Z³ is -O-, -S-, -SO-, -SO₂- or a group of the formula -N(R⁶)- (wherein R⁶ is a hydrogen atom, a C₁-C₆ alkylcarbonyl group, a halo-C₁-C₆ alkylcarbonyl group, a C₁-C₆ alkoxy carbonyl group, a phenylcarbonyl group, a substituted phenylcarbonyl group having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group and a halo-C₁-C₆ alkylsulfonyl group, a phenyl C₁-C₄ alkoxy carbonyl group, or a substituted phenyl C₁-C₄ alkoxy carbonyl group having at least one substituent, in the phenyl ring, which may be the same or different and is selected from the group consisting of a halogen atom, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group and a halo-C₁-C₆ alkylsulfonyl group); and R⁵ is a hydrogen atom, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₃-C₆ alkenyl group, a halo-C₃-C₆ alkenyl group, a C₃-C₆ alkynyl group, a halo-C₃-C₆ alkynyl group, a C₃-C₆ cycloalkyl group, a halo-C₃-C₆ cycloalkyl group, a C₁-C₆ alkylcarbonyl group, a halo-C₁-C₆ alkylcarbonyl group, a phenyl group, a substituted phenyl group having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfonyl group, a C₁-C₆ alkylsulfonyl group and a halo-C₁-C₆ alkylsulfonyl group, a phenyl C₁-C₄ alkyl group, a substituted phenyl C₁-C₄ alkyl group having at least one substituent, in the phenyl ring, which may be the same or different and is selected from the group consisting of a halogen atom, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group and a halo-C₁-C₆ alkylsulfonyl group, a heterocyclic group (which is the same as defined above), or a substituted heterocyclic group (wherein the heterocyclic ring is the same as defined above) having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group and a halo-C₁-C₆ alkylsulfonyl group); and L is an integer of 1 to 4); further,

R¹ and R² may form a 4 to 7 membered ring by combining to each other, in which the ring may contain the same or different 1 to 3 hetero atoms selected from the group consisting of oxygen atom, sulfur atom and nitrogen atom;

X is a hydrogen atom or a nitro group;

Y¹ and Y³ may be the same or different and are each a hydrogen atom, a halogen atom, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a phenoxy group, a substituted phenoxy group having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group and a halo-C₁-C₆ alkylsulfonyl group, a pyridyloxy group, a substituted pyridyloxy group having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a halo-C₁-C₆ alkyl group, a halo-C₁-C₆ alkoxy group, a halo-C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylsulfinyl group and a halo-C₁-C₆ alkylsulfonyl group;

⁵ Y² is a halo-C₃-C₆ cycloalkyl group, a phenyl group, a substituted phenyl group having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a halo-C₁-C₆ alkyl group, a halo-C₁-C₆ alkoxy group, a halo-C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylsulfinyl group and a halo-C₁-C₆ alkylsulfonyl group, a heterocyclic group (which is the same as defined above), a substituted heterocyclic group (wherein the heterocyclic group is the same as defined above) having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a halo-C₁-C₆ alkyl group, a halo-C₁-C₆ alkoxy group, a halo-C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylsulfinyl group and a halo-C₁-C₆ alkylsulfonyl group, or a group of the formula -A²-R⁷ (wherein A² is -O-, -S-, -SO-, -SO₂-, a halo-C₁-C₆ alkylene group, a C₂-C₆ alkenylene group, a halo-C₂-C₆ alkenylene group, a C₂-C₆ alkynylene group or a halo-C₃-C₆ alkynylene group and,

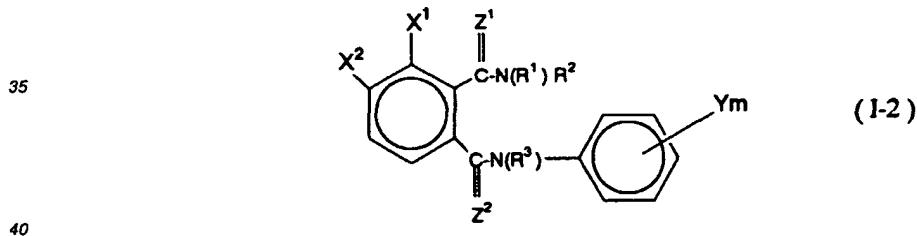
(1) when A^2 is $-O-$, $-S-$, $-SO-$ or $-SO_2-$, then R^7 is a halo- C_3-C_6 cycloalkyl group, a halo- C_3-C_6 cycloalkenyl group, a substituted phenyl group having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a halo- C_1-C_6 alkyl group, a halo- C_1-C_6 alkoxy group, a halo- C_1-C_6 alkylthio group, a halo- C_1-C_6 alkylsulfinyl group and a halo- C_1-C_6 alkylsulfonyl group, a heterocyclic group (which is the same as defined above), a substituted heterocyclic group (wherein the heterocyclic ring is the same as defined above) having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a halo- C_1-C_6 alkyl group, a halo- C_1-C_6 alkoxy group, a halo- C_1-C_6 alkylthio group, a halo- C_1-C_6 alkylsulfinyl group and a halo- C_1-C_6 alkylsulfonyl group, or a group of the formula $-A^3-R^9$ (wherein A^3 is a halo- C_1-C_6 alkylene group, a halo- C_3-C_6 alkenylene group, a C_3-C_6 alkynylene group or a halo- C_3-C_6 alkynylene group; and R^9 is a hydrogen atom, a halogen atom, a phenyl group, a substituted phenyl group having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a halo- C_1-C_6 alkyl group, a halo- C_1-C_6 alkoxy group, a halo- C_1-C_6 alkylthio group, a halo- C_1-C_6 alkylsulfinyl group and a halo- C_1-C_6 alkylsulfonyl group or a group of the formula $-A^4-R^{10}$ (wherein A^4 is $-O-$, $-S-$ or $-SO_2-$; and R^{10} is a C_1-C_6 alkyl group, a halo- C_1-C_6 alkyl group, a C_3-C_6 alkenyl group, a halo- C_3-C_6 alkenyl group, a C_3-C_6 cycloalkyl group, a halo- C_3-C_6 cycloalkyl group, a phenyl group, a substituted phenyl group having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a halo- C_1-C_6 alkyl group, a halo- C_1-C_6 alkoxy group, a halo- C_1-C_6 alkylthio group, a halo- C_1-C_6 alkylsulfinyl group and a halo- C_1-C_6 alkylsulfonyl group, a heterocyclic group (which is the same as defined above), a substituted heterocyclic group (wherein the heterocyclic ring is the same as defined above) having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a halo- C_1-C_6 alkyl group, a halo- C_1-C_6 alkoxy group, a halo- C_1-C_6 alkylthio group, a halo- C_1-C_6 alkylsulfinyl group and a halo- C_1-C_6 alkylsulfonyl group));

35 (2) when A^2 is a halo-C₁-C₆ alkylene group, a C₂-C₆ alkenylene group, a halo-C₂-C₆ alkenylene group, a C₂-C₆ alkynylene group or a halo-C₃-C₆ alkynylene group, then R⁷ is a hydrogen atom, a halogen atom, a halo-C₃-C₆ cycloalkyl group, a phenyl group, a substituted phenyl group having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a halo-C₁-C₆ alkyl group, a halo-C₁-C₆ alkoxy group, a halo-C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylsulfinyl group and a halo-C₁-C₆ alkylsulfonyl group, or a group of the formula -A⁵-R¹² (wherein A⁵ is -O-, -S-, -SO- or -SO₂⁻; and R¹² is a C₃-C₆ cycloalkyl group, a halo-C₃-C₆ cycloalkyl group, a phenyl group, a substituted phenyl group having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a halo-C₁-C₆ alkyl group, a halo-C₁-C₆ alkoxy group, a halo-C₁-C₆ alkylthio group, a heterocyclic group (which is the same as defined above), a substituted heterocyclic group (wherein the heterocyclic group is the same as defined above) having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a halo-C₁-C₆ alkyl group, a halo-C₁-C₆ alkoxy group, a halo-C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylsulfinyl group and a halo-C₁-C₆ alkylsulfonyl group; or a group of the formula -A⁶-R¹⁴ (wherein A⁶ is a C₁-C₆ alkylene group, a halo-C₁-C₆ alkylene group, a C₂-C₆ alkenylene group, a halo-C₂-C₆ alkenylene group, a C₂-C₆ alkynylene group or a halo-C₃-C₆ alkynylene group; and R¹⁴ is a hydrogen atom, a halogen atom, a halo-C₃-C₆ cycloalkyl group, a halo-C₁-C₆ alkoxy group, a halo-C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfonyl group, a phenyl group, a substituted phenyl group having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a halo-C₁-C₆ alkyl group, a halo-C₁-C₆ alkoxy group, a halo-C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylsulfinyl group and a halo-C₁-C₆ alkylsulfonyl group, a phenoxy group, a substituted phenoxy group having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a halo-C₁-C₆ alkyl group, a halo-C₁-C₆ alkoxy group, a halo-C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylsulfinyl group and a halo-C₁-C₆ alkylsulfonyl group and a

halo-C₁-C₆ alkylsulfonyl group, a phenylthio group, a substituted phenylthio group having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a halo-C₁-C₆ alkyl group, a halo-C₁-C₆ alkoxy group, a halo-C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylsulfonyl group and a halo-C₁-C₆-alkylsulfonyl group, a heterocyclic group (which is the same as defined the above), or a substituted heterocyclic group (wherein the heterocyclic group is the same as defined above) having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a halo-C₁-C₆ alkyl group, a halo-C₁-C₆ alkoxy group, a halo-C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylsulfonyl group and a halo-C₁-C₆ alkylsulfonyl group)); further,

Y¹ and Y² may form a condensed ring (which means naphthalene, tetrahydronaphthalene, indene, indane, quinoline, quinazoline, chroman, isochroman, indole, indoline, benzodioxane, benzodioxole, benzofuran, dihydrobenzofuran, benzothiophene, dihydrobenzothiophene, benzoxazole, benzothiazole, benzimidazole or indazole) by combining to each other together with the adjacent Y³, said condensed ring may have at least one substituent, which is the same or different, selected from the group consisting of a halogen atom, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group, a halo-C₁-C₆ alkylsulfonyl group, a phenyl group, a substituted phenyl group having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group and a halo-C₁-C₆ alkylsulfonyl group, a heterocyclic group (which is the same as defined the above), and a substituted heterocyclic group (wherein the heterocyclic group is the same as defined above) having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group and a halo-C₁-C₆ alkylsulfonyl group; and Z¹ and Z² are each an oxygen atom or a sulfur atom}.

9. The agricultural and horticultural insecticides according to Claim 7, containing as the active ingredient, a phthalic acid diamide derivative represented by the general formula (I-2),



{wherein, R¹, R² and R³ may be the same or different, and are each a hydrogen atom, a C₃-C₆ cycloalkyl group, a halo-C₃-C₆ cycloalkyl group or a group of the formula -A¹-Q₁ (wherein, A¹ is a C₁-C₈ alkylene group, a C₃-C₆ alkylene group or a C₃-C₆ alkynylene group; Q₁ is a hydrogen atom, a halogen atom, a cyano group, a nitro group, a halo-C₁-C₆ alkyl group, a C₃-C₆ cycloalkyl group, a halo-C₃-C₆ cycloalkyl group, a C₁-C₆ alkoxy carbonyl group, a di-C₁-C₆ alkoxyphosphoryl group which may be the same or different, a di-C₁-C₆ alkoxythiophosphoryl group which may be the same or different, a diphenylphosphino group, a diphenylphosphono group, a phenyl group, a substituted phenyl group having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group and a halo-C₁-C₆ alkylsulfonyl group, a heterocyclic group (which means pyridyl group, pyridine-N-oxide group, pyrimidinyl group, furyl group, tetrahydrofuryl group, thienyl group, tetrahydrothienyl group, tetrahydropyranyl group, tetrahydrothiopyranyl group, oxazolyl group, isoxazolyl group, oxadiazolyl group, thiazolyl group, isothiazolyl group, thiadiazolyl group, imidazolyl group, triazolyl group or pyrazolyl group), a substituted heterocyclic group (wherein the heterocyclic group is the same as defined above) having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group and a halo-C₁-C₆ alkylsulfonyl group}); further,

alkylthio group, a halo-C₁-C₆ alkythio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfonyl group and a halo-C₁-C₆ alkylsulfonyl group, or a group of the formula -Z³-R⁵ (wherein Z³ is -O-, -S-, -SO-, -SO₂- or a group of the formula -N(R⁶)- (wherein R⁶ is a hydrogen atom, a C₁-C₆ alkylcarbonyl group a halo-C₁-C₆ alkylcarbonyl group, a C₁-C₆ alkoxy carbonyl group, a phenylcarbonyl group, a substituted phenylcarbonyl group having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group and a halo-C₁-C₆ alkylsulfonyl group, a phenyl C₁-C₄ alkoxy carbonyl group, or a substituted phenyl C₁-C₄ alkoxy carbonyl group having at least one substituent, in the phenyl ring, which may be the same or different and is selected from the group consisting of a halogen atom, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group and a halo-C₁-C₆ alkylsulfonyl group); and

R⁵ is a hydrogen atom, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₃-C₆ alkenyl group, a halo-C₃-C₆ alkenyl group, a C₃-C₆ alkynyl group, a halo-C₃-C₆ alkynyl group, a C₃-C₆ cycloalkyl group, a halo-C₃-C₆ cycloalkyl group, a C₁-C₆ alkylcarbonyl group, a halo-C₁-C₆ alkylcarbonyl group and a C₁-C₆ alkoxy carbonyl group, a phenyl group, a substituted phenyl group having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group and a halo-C₁-C₆ alkylsulfonyl group, a phenyl C₁-C₄ alkyl group, a substituted phenyl C₁-C₄ alkyl group having at least one substituent, in the phenyl ring, which may be the same or different and is selected from the group consisting of a halogen atom, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group and a halo-C₁-C₆ alkylsulfonyl group, a heterocyclic group (which is the same as defined above), or a substituted heterocyclic group (wherein the heterocyclic group is the same as defined above) having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group and a halo-C₁-C₆ alkylsulfonyl group); and £ is an integer of 1 to 4); further,

R¹ and R² may form a 4 to 7 membered ring by combining to each other, in which the ring may contain the same or different 1 to 3 hetero atoms selected from the group consisting of oxygen atom, sulfur atom and nitrogen atom;

X¹ and X² may be the same or different and are each a halogen atom, a cyano group, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group and a halo-C₁-C₆ alkylsulfonyl group; further, X¹ and X² may form a condensed ring (which means naphthalene, tetrahydronaphthalene, indene, indane, quinoline, quinazoline, chroman, isochroman, indole, indoline, benzodioxane, benzodioxole, benzofuran, dihydrobenzofuran, benzothiophene, dihydrobenzothiophene, benzoxazole, benzothiazole, benzimidazole or indazole) by combining to each other, and said condensed ring may have at least one substituent, which is the same or different and is selected from the group consisting of a halogen atom, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group, a halo-C₁-C₆ alkylsulfonyl group, a phenyl group, a substituted phenyl group having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group and a halo-C₁-C₆ alkylsulfonyl group, a heterocyclic group (which is the same as defined above), and a substituted heterocyclic group (wherein the heterocyclic group is the same as defined above) having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group and a halo-C₁-C₆ alkylsulfonyl group, a heterocyclic group (which is the same as defined above), and a substituted heterocyclic group (wherein the heterocyclic group is the same as defined above) having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group and a halo-C₁-C₆ alkylsulfonyl group;

Y is the same or different, and are each a hydrogen atom, a halogen atom, a cyano group, a nitro group, a halo-C₃-C₆ cycloalkyl group, a phenyl group, a substituted phenyl group having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group and a halo-C₁-C₆ alkylsulfonyl group;

C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group and a halo-C₁-C₆ alkylsulfonyl group, a heterocyclic group (which is the same as defined above), a substituted heterocyclic group (wherein the heterocyclic group is the same as defined above) having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group and a halo-C₁-C₆ alkylsulfonyl group, or a group of -A²-R⁷ (wherein A² is -O-, -S-, -SO₂-, -SO₂-, -C(=O)-, -C=NOR⁸-, (wherein R⁸ is a hydrogen atom, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₃-C₆ alkenyl group, a halo-C₃-C₆ alkenyl group, a C₃-C₆ alkynyl group, a C₃-C₆ cycloalkyl group, a phenyl-C₁-C₄ alkyl group, or a substituted phenyl-C₁-C₄ alkyl group having at least one substituent, in the phenyl ring, which may be the same or different and is selected from the group consisting of a halogen atom, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group and a halo-C₁-C₆ alkylsulfonyl group), a C₁-C₆ alkylene group, a halo-C₁-C₆ alkylene group, a C₂-C₆ alkenylene group, a halo-C₂-C₆ alkenylene group, a C₂-C₆ alkynylene group or a halo-C₃-C₆ alkynylene group;

(1) when A^2 is $-O-$, $-S-$, $-SO-$ or $-SO_2-$, then R^7 is a halo- C_3-C_6 cycloalkyl group, a halo- C_3-C_6 cycloalkenyl group, a phenyl group, a substituted phenyl group having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a C_1-C_6 alkyl group, a halo- C_1-C_6 alkyl group, a C_1-C_6 alkoxy group, a halo- C_1-C_6 alkoxy group, a C_1-C_6 alkylthio group, a halo- C_1-C_6 alkylthio group, a C_1-C_6 alkylsulfinyl group, a halo- C_1-C_6 alkylsulfinyl group, a C_1-C_6 alkylsulfonyl group and a halo- C_1-C_6 alkylsulfonyl group, a heterocyclic group (which is the same as defined above), a substituted heterocyclic group (wherein the heterocyclic group is the same as defined above) having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a C_1-C_6 alkyl group, a halo- C_1-C_6 alkyl group, a C_1-C_6 alkoxy group, a halo- C_1-C_6 alkoxy group, a C_1-C_6 alkylthio group, a halo- C_1-C_6 alkylthio group, a C_1-C_6 alkylsulfinyl group, a halo- C_1-C_6 alkylsulfinyl group, a C_1-C_6 alkylsulfonyl group and a halo- C_1-C_6 alkylsulfonyl group, or a group of the formula $-A^3-R^9$ (wherein A^3 is a C_1-C_6 alkylene group, a halo- C_1-C_6 alkylene group, a C_3-C_6 alkenylene group, a halo- C_3-C_6 alkenylene group, a C_3-C_6 alkynylene group or a halo- C_3-C_6 alkynylene group; R^9 is a hydrogen atom, a halogen atom, a C_3-C_6 cycloalkyl group, a halo- C_3-C_6 cycloalkyl group, a C_1-C_6 alkoxy carbonyl group, a phenyl group, a substituted phenyl group having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a C_1-C_6 alkyl group, a halo- C_1-C_6 alkyl group, a C_1-C_6 alkoxy group, a halo- C_1-C_6 alkoxy group, a C_1-C_6 alkylthio group, a halo- C_1-C_6 alkylthio group, a C_1-C_6 alkylsulfinyl group, a halo- C_1-C_6 alkylsulfinyl group, a C_1-C_6 alkylsulfonyl group and a halo- C_1-C_6 alkylsulfonyl group, or a group of the formula $-A^4-R^{10}$ (wherein A^4 is $-O-$, $-S-$, $-SO-$, $-SO_2-$ or $-C(=O)-$, and R^{10} is a C_1-C_6 alkyl group, a halo- C_1-C_6 alkyl group, a C_3-C_6 alkenyl group, a halo- C_3-C_6 alkenyl group, a C_3-C_6 cycloalkyl group, a halo- C_3-C_6 cycloalkyl group, a phenyl group, a substituted phenyl group having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a C_1-C_6 alkyl group, a halo- C_1-C_6 alkyl group, a C_1-C_6 alkoxy group, a halo- C_1-C_6 alkoxy group, a C_1-C_6 alkylthio group, a halo- C_1-C_6 alkylthio group, a C_1-C_6 alkylsulfinyl group, a halo- C_1-C_6 alkylsulfinyl group, a C_1-C_6 alkylsulfonyl group and a halo- C_1-C_6 alkylsulfonyl group, a heterocyclic group (which is the same as defined above), or a substituted heterocyclic group (wherein the heterocyclic group is the same as defined above) having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a C_1-C_6 alkyl group, a halo- C_1-C_6 alkyl group, a C_1-C_6 alkoxy group, a halo- C_1-C_6 alkoxy group, a C_1-C_6 alkylthio group, a halo- C_1-C_6 alkylthio group, a C_1-C_6 alkylsulfinyl group, a halo- C_1-C_6 alkylsulfinyl group, a C_1-C_6 alkylsulfonyl group and a halo- C_1-C_6 alkylsulfonyl group));

(2) when A² is -C(=O)- or a group of the formula -C(=NOR⁸)-(wherein R⁸ is the same as defined above), then R⁷ is a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₂-C₆ alkenyl group, a halo-C₂-C₆ alkenyl group, a C₃-C₆ cycloalkyl group, a halo-C₃-C₆ cycloalkyl group, a C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a mono-C₁-C₆ alkylamino group, a di-C₁-C₆ alkylamino group which may be the same or different, a phenyl group, a substituted phenyl group having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group and a halo-C₁-C₆ alkylsulfonyl group, a phenylamino group, a substituted phenylamino group having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆

alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfanyl group, a halo-C₁-C₆ alkylsulfanyl group, a C₁-C₆ alkylsulfonyl group, and a halo-C₁-C₆ alkylsulfonyl group, a heterocyclic group (which is the same as defined the above), or a substituted heterocyclic group (wherein the heterocyclic group is the same as defined the above) having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfanyl group, a halo-C₁-C₆ alkylsulfanyl group, a C₁-C₆ alkylsulfonyl group and a halo-C₁-C₆ alkylsulfonyl group,

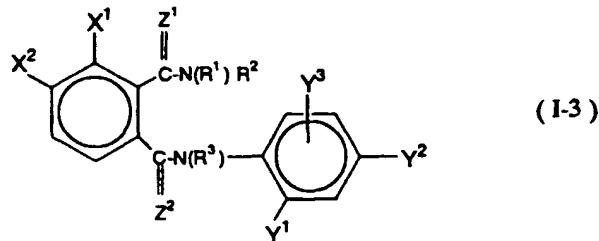
further, Y may form a condensed ring (which is the same as defined above) by combining together with the

adjacent carbon atoms in the phenyl ring, said condensed ring may have at least one substituent, which is the same or different and is selected from the group consisting of a halogen atom, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group, a halo-C₁-C₆ alkylsulfonyl group, a phenyl group, a substituted phenyl group having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group and a halo-C₁-C₆ alkylsulfonyl group, a heterocyclic group (which is the same as defined above), and a substituted heterocyclic group (wherein the heterocyclic group is the same as defined above) having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group and a halo-C₁-C₆ alkylsulfonyl group;

15 Z¹ and Z² are each an oxygen atom or a sulfur atom).

10. The agricultural and horticultural insecticides according to Claim 9, containing as the effective ingredient, a phthalic acid diamide derivative represented by the general formula (I-3).

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{wherein, R¹, R² and R³ may be the same or different, and are each a hydrogen atom, a C₃-C₆ cycloalkyl group, a halo-C₃-C₆ cycloalkyl group or a group of the formula -A¹-Q₁ (wherein, A¹ is a C₁-C₆ alkylene group, a C₃-C₆ alkenylene group or a C₃-C₆ alkynylene group; Q₁ is a hydrogen atom, a halogen atom, a cyano group, a nitro group, a halo-C₁-C₆ alkyl group, a C₃-C₆ cycloalkyl group, a halo-C₃-C₆ cycloalkyl group, a C₁-C₆ alkoxy carbonyl group, a di-C₁-C₆ alkoxyphosphoryl group which may be the same or different, a di-C₁-C₆ alkoxythiophosphoryl group which may be the same or different, a diphenylphosphino group, a diphenylphosphono group, a phenyl group, a substituted phenyl group having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group and a halo-C₁-C₆ alkylsulfonyl group, a heterocyclic group (which means pyridyl group, pyridine-N-oxide group, pyrimidinyl group, furyl group, tetrahydrofuryl group, thieryl group, tetrahydrothienyl group, tetrahydropyranyl group, tetrahydrothiopyranyl group, oxazolyl group, isoxazolyl group, oxadiazolyl group, thiazolyl group, isothiazolyl group, thiadiazolyl group, imidazolyl group, triazolyl group or pyrazolyl group), a substituted heterocyclic group (wherein the heterocyclic group is the same as defined above) having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group and halo-C₁-C₆ alkylsulfonyl group, or a group of the formula -Z³-R⁵ (wherein Z³ is -O-, -S-, -SO-, -SO₂- or a group of the formula -N(R⁶)- (wherein R⁶ is a hydrogen atom, a C₁-C₆ alkylcarbonyl group, a C₁-C₆ alkoxy carbonyl group, a phenyl carbonyl group, a substituted phenyl carbonyl group having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group and a halo-C₁-C₆ alkylsulfonyl group, a phenyl C₁-C₄ alkoxy carbonyl group, or a substituted phenyl C₁-C₄ alkoxy carbonyl group having at least one substituent, in the phenyl ring, which may be the same or different and is selected from the group consisting of a halogen atom, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group and a halo-C₁-C₆ alkylsulfonyl group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group and a halo-C₁-C₆ alkylsul-

fonyl group); and

R⁵ is a hydrogen atom, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₃-C₆ alkenyl group, a halo-C₃-C₆ alkenyl group, a C₃-C₆ alkynyl group, a halo-C₃-C₆ alkynyl group, a C₃-C₆ cycloalkyl group, a halo-C₃-C₆ cycloalkyl group, a C₁-C₆ alkylcarbonyl group, a halo-C₁-C₆ alkylcarbonyl group, a C₁-C₆ alkoxy carbonyl group, a phenyl group, a substituted phenyl group having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group and a halo-C₁-C₆ alkylsulfonyl group, a phenyl C₁-C₄ alkyl group, a substituted phenyl C₁-C₄ alkyl group having at least one substituent, in the phenyl ring, which may be the same or different and is selected from the group consisting of a halogen atom, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group and a halo-C₁-C₆ alkylsulfonyl group, a heterocyclic group (which is the same as defined above), or a substituted heterocyclic group (wherein the heterocyclic group is the same as defined above) having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group and a halo-C₁-C₆ alkylsulfonyl group); and L is an integer of 1 to 4; further,

R¹ and R² may form a 4 to 7 membered ring by combining to each other, in which the ring may contain the same or different 1 to 3 hetero atoms selected from the group consisting of oxygen atom, sulfur atom and nitrogen atom;

X¹ and X² may be the same or different and are each a halogen atom, a cyano group, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group and a halo-C₁-C₆ alkylsulfonyl group; further, X¹ and X² may form a condensed ring (which means naphthalene, tetrahydronaphthalene, indene, indane, quinoline, quinazoline, chroman, isochroman, indole, indoline, benzodioxane, benzodioxole, benzofuran, dihydrobenzofuran, benzothiophene, dihydrobenzothiophene, benzoxazole, benzothiazole, benzimidazole or indazole) by combining to each other, and said condensed ring may have at least one substituent, which is the same or different and is selected from the group consisting of a halogen atom, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group, a halo-C₁-C₆ alkylsulfonyl group, a phenyl group, a substituted phenyl group having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group and a halo-C₁-C₆ alkylsulfonyl group, a heterocyclic group (which is the same as defined above), and a substituted heterocyclic group (wherein the heterocyclic group is the same as defined above) having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group and a halo-C₁-C₆ alkylsulfonyl group, a heterocyclic group (which is the same as defined above), and a substituted heterocyclic group (wherein the heterocyclic group is the same as defined above) having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group, a halo-C₁-C₆ alkylsulfonyl group and a halo-C₁-C₆ alkylsulfonyl group;

Y¹ and Y³ may be the same or different, and are each a hydrogen atom, a halogen atom, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group, a halo-C₁-C₆ alkylsulfonyl group and a halo-C₁-C₆ alkylsulfonyl group, a phenoxy group, a substituted phenoxy group having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group and a halo-C₁-C₆ alkylsulfonyl group, a pyridyloxy group, or a substituted pyridyloxy group having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group and a halo-C₁-C₆ alkylsulfonyl group,

Y² is a hydrogen atom, a halogen atom, a halo-C₃-C₆ cycloalkyl group or a group of the formula -A²-R⁷ (wherein A² -O-, -S-, -SO-, -SO₂-, a C₁-C₆ alkylene group, a halo-C₁-C₆ alkylene group, a C₂-C₆ alkenylene group, a halo-C₂-C₆ alkenylene group, a C₂-C₆ alkynylene group, or a halo-C₃-C₆ alkynylene group, and

(1) when A² is -O-, -S-, -SO- or -SO₂-, then R⁷ is a halo-C₃-C₆ cycloalkyl group, a substituted phenyl group having at least one substituent, which is the same or different and is selected from the group consisting of

a halogen atom, a halo-C₁-C₆ alkyl group, a halo-C₁-C₆ alkoxy group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group and a halo-C₁-C₆ alkylsulfonyl group, a substituted pyridyloxy group having at least one substituent, which is the same or different and is selected from the group consisting of a halogen atom, a halo-C₁-C₆ alkyl group, a halo-C₁-C₆ alkoxy group, a halo-C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylsulfinyl group and a halo-C₁-C₆ alkylsulfonyl group, or a group of the formula -A³-R⁹ (wherein A³ is a halo-C₁-C₆ alkylene group, or a halo-C₃-C₆ alkenylene group; and R⁹ is a hydrogen atom, a halogen atom, a halo-C₃-C₆ cycloalkyl group, a phenyl group, a substituted phenyl group having at least one substituent, which is the same or different and is selected from the group consisting of a halogen atom a halo-C₁-C₆ alkyl group, a halo-C₁-C₆ alkoxy group, a halo-C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylsulfinyl group and a halo-C₁-C₆ alkylsulfonyl group, or a group of the formula -A⁴-R¹⁰ (wherein A⁴ is -O-, -S-, -SO- or -SO₂-; R¹⁰ is a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₃-C₆ alkenyl group, a halo-C₃-C₆ alkenyl group, a C₃-C₆ cycloalkyl group, a halo-C₃-C₆ cycloalkyl group, a phenyl group, or a substituted phenyl group having at least one substituent, which is the same or different and is selected from the group consisting of a halogen atom a halo-C₁-C₆ alkyl group, a halo-C₁-C₆ alkoxy group, a halo-C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylsulfinyl group and a halo-C₁-C₆ alkylsulfonyl group));

(2) when A² is a C₁-C₆ alkylene group, a halo-C₁-C₆ alkylene group, a C₂-C₆ alkenylene group, a halo-C₂-C₆ alkenylene group, a C₂-C₆ alkynylene group, a halo-C₃-C₆ alkynylene group, then R⁷ is a hydrogen atom, a halogen atom, a halo-C₃-C₆ cycloalkyl group, a phenyl group, a substituted phenyl group having at least one substituent, which is the same or different and is selected from the group consisting of a halogen atom, a halo-C₁-C₆ alkyl group, a halo-C₁-C₆ alkoxy group, a halo-C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylsulfinyl group and a halo-C₁-C₆ alkylsulfonyl group, or a group of the formula -A⁵-R¹² (wherein A⁵ is -O-, -S-, -SO- or -SO₂-; and R¹² is a C₃-C₆ cycloalkyl group, a halo-C₃-C₆ cycloalkyl group, a phenyl group, a substituted phenyl group having at least one substituent, which is the same or different and is selected from the group consisting of a halogen atom, a halo-C₁-C₆ alkyl group, a halo-C₁-C₆ alkoxy group, a halo-C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylsulfinyl group and a halo-C₁-C₆ alkylsulfonyl group, or a group of the formula -A⁶-R¹⁴ (wherein A⁶ is a C₁-C₆ alkylene group, a halo-C₁-C₆ alkylene group, a C₂-C₆ alkenylene group, a halo-C₂-C₆ alkenylene group; and R¹⁴ is a hydrogen atom, a halogen atom, a halo-C₃-C₆ cycloalkyl group, a halo-C₁-C₆ alkoxy group, a halo-C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfonyl group, a phenyl group, a substituted phenyl group having at least one substituent, which is the same or different and is selected from the group consisting of a halogen atom, a halo-C₁-C₆ alkyl group, a halo-C₁-C₆ alkoxy group, a halo-C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylsulfinyl group and a halo-C₁-C₆ alkylsulfonyl group, a phenoxy group, a substituted phenoxy group having at least one substituent, which is the same or different and is selected from the group consisting of a halogen atom, a halo-C₁-C₆ alkyl group, a halo-C₁-C₆ alkoxy group, a halo-C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylsulfinyl group and a halo-C₁-C₆ alkylsulfonyl group, a phenylthio group, or a substituted phenylthio group having at least one substituent, which is the same or different and is selected from the group consisting of a halogen atom, a halo-C₁-C₆ alkyl group, a halo-C₁-C₆ alkoxy group, a halo-C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylsulfinyl group and a halo-C₁-C₆ alkylsulfonyl group);

further, Y¹ and Y² may form a condensed ring (the condensed ring is the same as defined above) by combining to each other together with Y³, and said condensed ring may have at least one substituent, which is the same or different and is selected from the group consisting of a halogen atom, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group, a halo-C₁-C₆ alkylsulfonyl group, a phenyl group, and a substituted phenyl group having at least one substituent which may be the same or different and is selected from the group consisting of a halogen atom, a C₁-C₆ alkyl group, a halo-C₁-C₆ alkyl group, a C₁-C₆ alkoxy group, a halo-C₁-C₆ alkoxy group, a C₁-C₆ alkylthio group, a halo-C₁-C₆ alkylthio group, a C₁-C₆ alkylsulfinyl group, a halo-C₁-C₆ alkylsulfinyl group, a C₁-C₆ alkylsulfonyl group and a halo-C₁-C₆ alkylsulfonyl group;

Z^1 and Z^2 are each an oxygen atom or a sulfur atom}.

11. A method for controlling undesirable insect pests for a useful crop, characterized by treating an objective crop with an effective amount of the agricultural and horticultural insecticides as claimed in any one of Claims 6 to 10.